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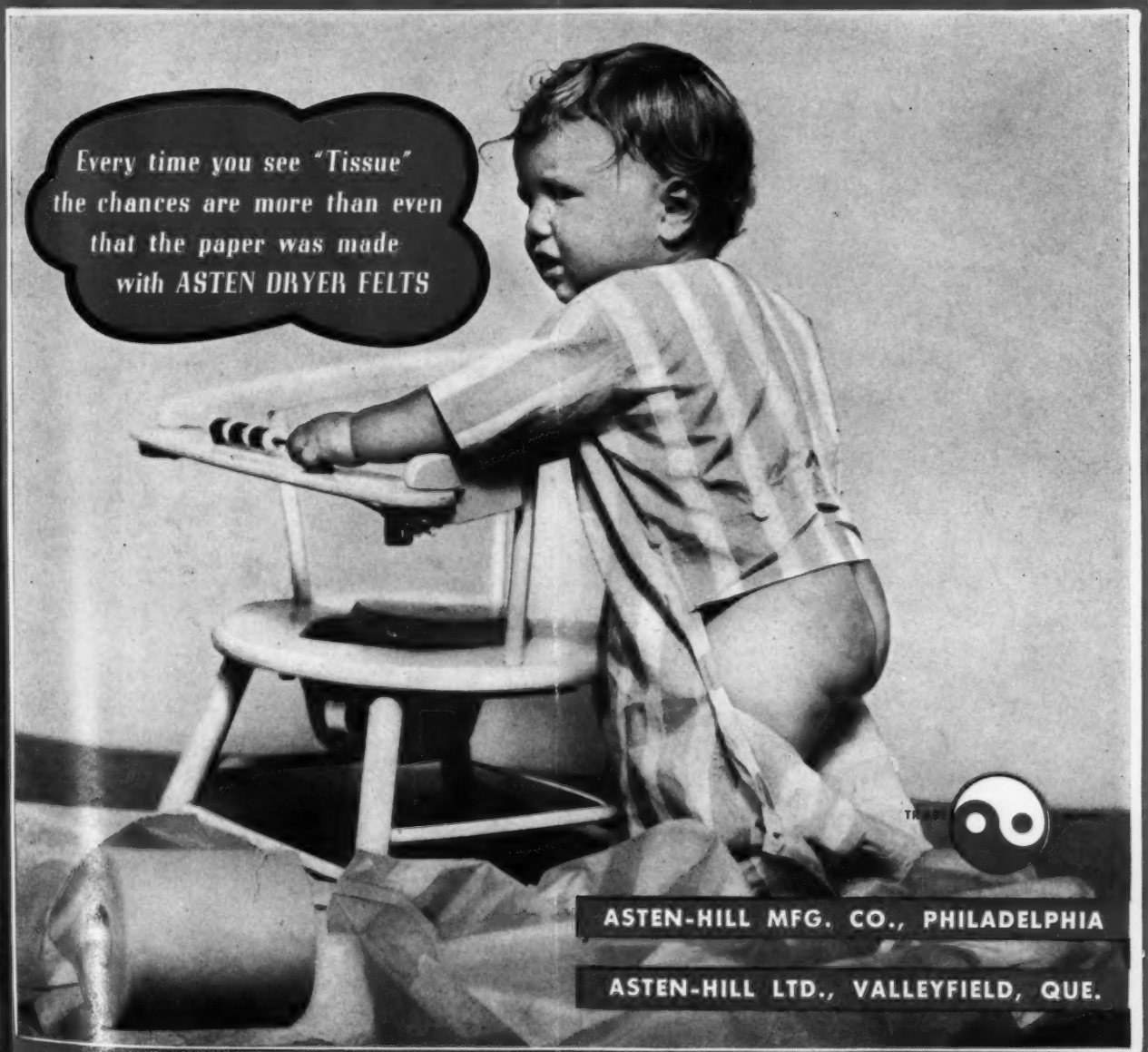
PAPER TRADE JOURNAL

FEBRUARY 14, 1946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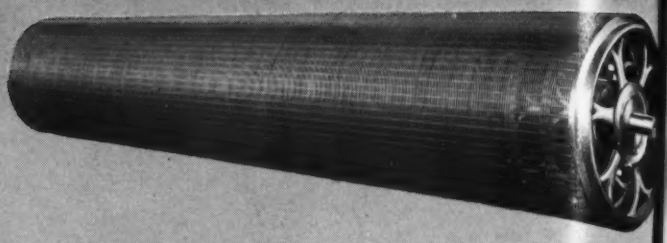

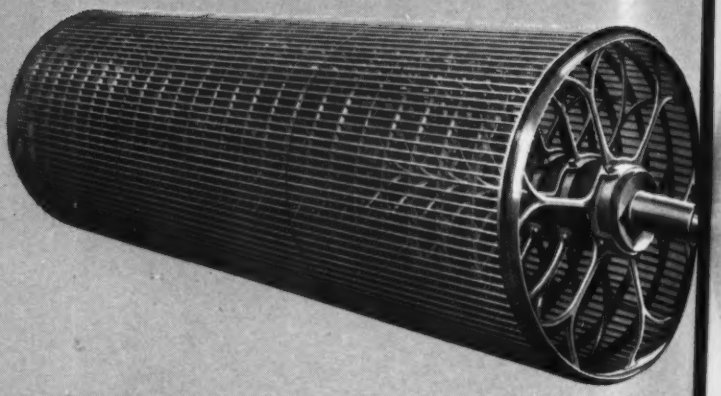

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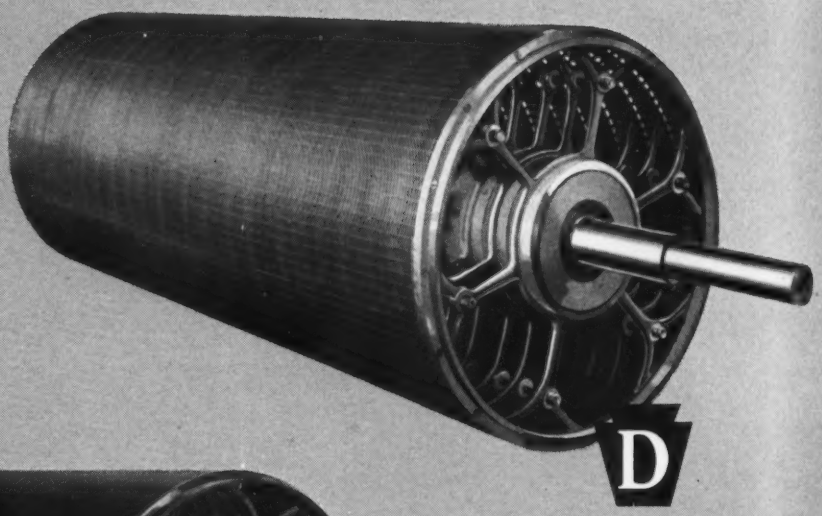

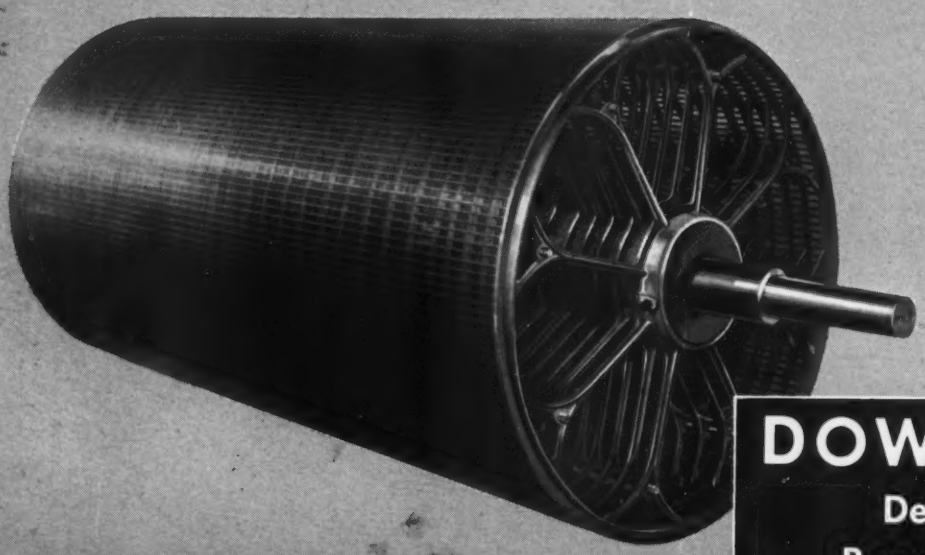

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Paper Making Machinery

PAPER TRADE JOURNAL

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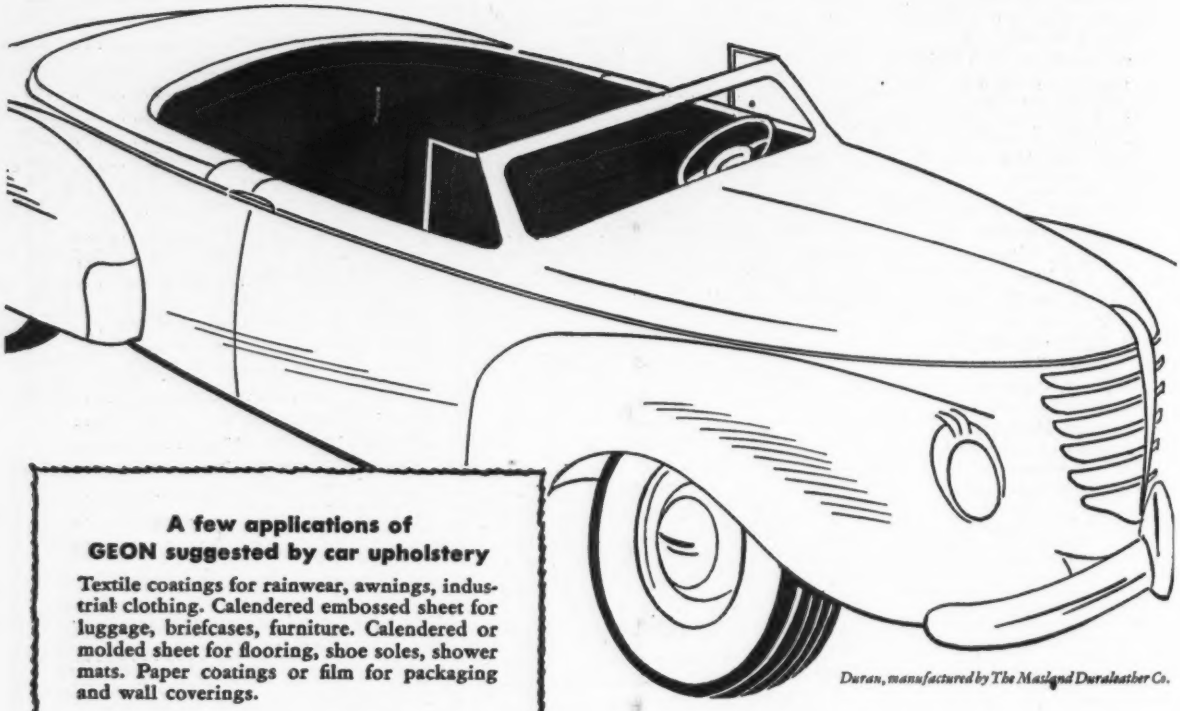

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Vol. 122, No. 7

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

February 14, 1946

Chicago Scrapes Bottom of Waste Bins

Continued Demand Is Met By Short Supply and Dwindling Collections — Robert Knox Succeeds His Brother As Paper Association President—Ditto To Sell Through Paper Merchants—Other News.

CHICAGO, Ill, February 11, 1946—A feature of the Chicago waste paper market this week was the continued demand for all grades. All prices were quoted firm at the ceiling levels according to local reports. Old newspaper has been quite short of the big demands and recent collections have been disappointing. A good part of this disappointment, say local trade circles, stems from the lack of wartime stimulus which resulted in heavy collections of old newspapers in particular.

Meanwhile, the remainder of the market remained little changed and with prospects not at all bright for the next few months. Reports circulated locally show that weather conditions in the pulp producing areas have been little better than the labor situation which has, according to one commentator, "shown no improvement".

Paper buyers, the "man on the street" who attempts to buy mimeograph papers for his regular office work and interoffice correspondence, are saying that they are having far more trouble now than they did six months ago. Buyers of coated stocks are likewise discontented over their lot although there is reported to be a wide selection in prospect in the near future as a result of government amendments which have had a direct effect on differentials. Prices were all at the ceiling point with the rising expense rates and falling volume causing the trade to wonder if it has not come materially close to the ultimate "squeeze" point.

Paper Group to Meet

The Chicago Professional Paper Group will hold its second meeting of 1946 on February 18 in the dining rooms of the Chicago Bar Association. The speaker, not as yet announced, is to discuss packaging problems confronting the industry today.

Brother Succeeds Brother as Association Head

New officers of the Chicago Paper Association include Robert Knox, Knox & Schneider Paper Company, president; William Chukerman, J. Chukerman & Son, first vice president; L. P. Brown, Atlas Paper Company, second vice president; William Shapland, Fred Rentz Paper Company, secretary and treasurer and John L. Richey, executive secretary and counsel. One of the interesting features of the election was the selection of Robert Knox as president to succeed William S. Knox, his brother. Robert recently returned to his company after services with the United States Army. Another feature of the meeting which brought together a large and enthusiastic audience of members of the coarse paper group, was the reading of a letter from Mayor Edward J. Kelly of Chicago thanking the association for its substantial support of the USO, one of the Mayor's genuinely "pet" organizations. The Association has for one of its major plans for 1946, the devising of ways and means of improving service to customers, a sound and constructive good will policy designed to consolidate gains along this line which have been made during the past few years.

Ditto Papers To Be Nationally Merchandised

Ditto, Incorporated, producer of duplicating papers, has recently announced that it intends to distribute the complete line of Ditto papers through the medium of paper merchants located in all parts of the country. It is reported that approximately one hundred jobbers are now being selected to do the merchandising job and meetings are now reported being arranged in various cities to acquaint the trade with the many uses of Ditto papers for various uses. Mark Peacock, sales manager of the paper division of Ditto, Incorporated, made the announcement to the trade press. Ditto is perhaps most well known to business men as the manufacturer of gelatin and liquid duplicating machines and supplies though the new developments in expanding the sale of Ditto duplicating papers are expected to make this product equally well known.

Ross Joins Moser Paper

R. D. Ross, formerly chief of the commercial printing section of the Printing and Publishing Division of the War Production Board, has recently joined the Moser Paper Company, Chicago paper jobbers. Mr. Ross will become a member of the Moser sales staff. The organization specializes in the distribution of a big line of fine papers.

Kellogg Will Talk to Press Men

Paul Kellogg, general manager of the Newsprint Association of Canada, will address the sessions of the Inland Daily Press Association to be held at the Congress Hotel, Chicago, February 19 and 20. There will also be a special report by the Association's "Good Neighbor" Newsprint Plan Committee and an opportunity for discussion of the government inventory order and the reported agitation for a further newsprint price increase.

Northwest Superintendents Hold Meeting

Eighty-Seven Representatives of Paper Mills Present At Sectional Session—Other Meetings Held At Other Paper Centers—Marathon Corp. To Vote On 2 For 1 Stock Split — Other Industrial News.

APPLETON, Wis., February 11, 1946—Eighty-seven representatives of paper mills attended sectional meetings of the Northwest division of the American Pulp and Paper Mill Superintendents Association Monday evening, February 4, at the Elks Club, Kaukauna, Wis., and 50 were present at Hotel Whiting, Stevens Point, Wis., on Tuesday evening, February 5, at a similar sectional meeting.

Additional gatherings were scheduled Thursday, February 7, at Port Arthur, Ontario, Canada, and Friday, February 8, at Cloquet, Minn. R. A. Nugent of the Nekoosa-Edwards Paper Company was the chairman at the Stevens Point meeting, and F. X. Kreiling of the Thilmany Pulp and Paper Company, Kaukauna, was chairman of the Kaukauna gathering. Lester J. Smith of the Combined Locks Paper Company, Combined Locks, Wis., is the divisional chairman.

There were four principal speakers who appeared at each of the four meetings: Harris Ware of the Hercules Powder Company's Papermakers Chemical division, Kalamazoo, Mich., who discussed "Casein"; Arthur Coffin of the Tetanium Pigments Company, Chicago, whose topic was "Tetanium Di-Oxide"; J. P. Strasser of Stein-Hall Manufacturing Company, Chicago, who spoke on "Starch," and A. C. Callighan of Edgar Brothers, New York, who discussed "Clays."

Others registered at the Kaukauna session were as follows: Consolidated Water Power and Paper Company, Appleton, T. W. Frank, F. H. Aldrich and A. H. Bunks; F. H. Leavens & Co., Neenah, E. P. Arpin; Fox River Paper Corporation, Appleton, A. Beaman, H. P. Dixson, F. D. Frampton, J. P. Haberman; Stebbins Engineering and Manufacturing Company, Watertown, N. Y., M. H. Bennett; Resinous Products and Chemical Company, Martin Bretl; Mead Sales Company, Chicago, D. Brittain; Thilmany Pulp and Paper Company, Kaukauna, L. J. Broehm, W. M. Carr, C. J. Chopin, R. Driessen, W. P. Gillen, A. A. Klammer, J. Leddy, A. M. Schmalz, R. Schmalz, F. Siebers, P. H. West; Manhattan Rubber Manufacturing Company, H. Chew, A. Campbell; Ingersoll Rand Company, G. L. Coltart; Combined Locks Paper Company, Combined Locks, Wis., G. Carroll, H. A. Chuse, W. Erickson, J. E. Hamilton, P. E. Jones, M. J. Killian, A. Piepenburg, B. L. Plank, E. C. Schuler, W. A. Springer, W. State, H. Vanderheil, R. Vogt; Simonds Worden White, C. Collipp; Pennsylvania Salt Manufacturing Company, T. W. Toovey, G. H. Corbin; Hercules Powder Company, H. Reeves, H. Martin, L. E. Fitzgerald, T. C. Foin, P. Easton; Wadhams Oil Company, J. Fike; Stein Hall & Co., Inc., H. F. Gardner; Gillespie Sales Agency, T. M. Gillespie; H. H. Gottleben; Benlo Chemicals, L. B. Greiner; Wadhams Division of Socony Vacuum, J. M. Hayes; Hermann Manufacturing Company, Lancaster, Ohio, G. A. Hermann; Sandy Hill Iron and Brass Works, Hudson Falls, N. Y., E. C. Jacobi; Falls Paper and Power Co., Oconto Falls, Wis., W. Johnson; Bristol Company, W. S. Kennedy; F. Kranhold, retired; Wisconsin Tissue Mills, Menasha, J. J. Kryszak; Appleton Woolen Mills, Appleton, Wis., C. J. McMahon; Badger Paper Mills, Peshtigo, Wis., R. W. Meyer, W. H. Wrinke; Wyandotte Chemicals Corporation, J. C. Mills; Central Engineering, Appleton, W. A. J. Mitchell; Appleton Wire Works, Appleton, S. Murphy; Titanium Pigment, N. E. Olson; D. J. Murray Manufacturing Company, M. L. Peterson; J. J. Plank & Co., Appleton, W. J. Plank; Appleton Machine Company, Appleton, R. M. Radsch; Douglas Robbins Company, Middletown, Ohio, D. Robbins; Foxboro Company, W. A. Schreiner; Central Engineering, F. Schwartz; Heller & Merz, W. L. Shaw; Neenah Paper Company, Neenah, I. J. Stafford; Institute of Paper Chemistry, Appleton, S. D. Wells.

Marathon To Vote on Stock Split

Recommendations of the board of directors providing for a two for one split of the common stock of Marathon Corporation, Rothschild, Wis., will be voted upon at a special meeting of the common stockholders at the company's offices on February 21, according to an announcement by D. C. Everest, president and general manager of the company.

The proposal is to increase the number of authorized shares from 400,000 of a par value of $12.50 each, now outstanding, to 1,300,000 shares of $6.25 per share.

It is contemplated that the corporation may authorize the sale of sufficient common stock in the near future to raise funds to retire its funded debt now outstanding and that the resulting freedom from bonded indebtedness and the savings effected in interest and sinking fund will greatly strengthen the company's financial position, Mr. Everest said. No commitments have been made, however.

Funded debt of the corporation outstanding at the close of its fiscal year October 31, 1945, was represented by $10,000,000 3¾% sinking fund debentures, due in 1959, held by the Equitable Life Assurance Society.

These debentures were issued in 1944 to finance the construction of a 300-ton daily capacity bleached sulphate pulp mill on the north shore of Lake Superior at Marathon Ontario. When the mill is completed in May or June, 1946, the corporation's mills in the United States will have an adequate supply of pulp to take care of their expanding paper and paperboard requirements.

Nekoosa-Edwards Has Soot Removal Plan

Nekoosa-Edwards Paper Company will spend an estimated $135,000 this year to rid the city of Nekoosa, Wis., from "soot" discharged from its mill smokestack. This was announced last week by John E. Alexander in a letter to the city council. Construction will begin this summer and is expected to be completed before the end of the year. Mr. Alexander said he has had plans for some time to correct the situation, but was unable to obtain equipment during the war.

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Pulp Research Leads Canadian Industry

Dominion Manufacturers Poll Turns Up Pulp and Paper Industries As Leading In Association Activity—Forestry Group Zealous In Preserving Timber — Campaign Launched For Bushworkers.

MONTREAL, Que., February 11, 1946—The pulp and paper industry has made greater strides than any other industry in collective research, it would appear from a report just issued by the Canadian Manufacturers Association. From 362 replies to a questionnaire addressed by the association to over 500 members, it reports that some 42 firms stated that the Canadian trade association of their industry did collective research, and that the majority of these are members of the Canadian Pulp and Paper Association, "which is fully equipped to carry out collective research for their trade."

This research has long been done by one of the best-equipped establishments for such work in the country, namely the Pulp and Paper Research Institute of Canada in Montreal, which is jointly supported and jointly directed by the Canadian Pulp and Paper Association, McGill University, and the Federal Government. The laboratories in this institute are supplemented by semi-commercial equipment for both ground wood and chemical pulping and paper manufacture.

Programs for research and investigation by the institute are initiated and prepared by the Technical and Woodlands Sections of the Canadian Pulp and Paper Association, so that the work of the institute is always kept in practical conformity with current problems and current developments. These two sections comprise strong bodies of the foremost authorities in the country on engineering, chemical, technical, mechanical matters and kindred subjects relating to the upbuilding of the forest industries and to the exploitation, protection and conservation of the forests. During the war the work of these two sections has been greatly intensified, and in the past 12 months both have made greater strides in membership than in any other similar period, the membership of the Technical Section now standing at over 700, and that of the Woodlands Section at 458.

More Than 40 Companies Have Laboratories

This collective research is supplemented by widespread individual research by pulp and paper companies. At the present time over 40 of these companies have their own laboratory facilities, a number being elaborate organizations housed in separate buildings, and they have an impressive record of the benefits of research as applied both to individual operations and to the industry as a whole. The most marked current trend in research in the industry is toward (1) utilization of all wood waste, both of the pulp mills and of the saw mills of the allied lumber industry, in the manufacture of pulp; and (2) the development of new products both from pulp and from waste liquor, in order to provide the greatest possible utilization of raw material and diversification of products. Remarkable strides in both directions have already been made.

Fundamentals in Forest Conservation

Robson Black, president of the Canadian Forestry Association, has laid down the fundamentals for a vast project in forest conservation to be undertaken on a nation-wide scale. His remarks are a follow-up of the commitments made by the Federal Government for extensive works for forest conservation, and its initiation of these works by the setting up of an organization for the suppression and control of destructive forest insects.

Mr. Black says that the basis of the conservation work which the Dominion and Provincial Governments must carry out must be to incorporate political and engineering processes into one joint enterprise directed to the management of soil conservation, water controls and forest management. To illustrate the bearing which each of these has on the other, he said that one of the most graphic illustrations lies in the forests growing on the east slope of the Rocky Mountains.

"They happen," he said, "to be the most important piece of forest treasure in the whole Dominion, because they govern the flow of virtually every river that waters the western plains. They represent a citadel guarding the ramparts of the West's richest possessions, her streamflow, her irrigation, her hydroelectric powers, the water levels of the ranchers' wells, the life of Alberta, Saskatchewan and northern Manitoba. Those watershed forests are in a state of subtraction. They have been showing an annual debit of 30,000 acres of fire loss, and it ought to be 30,000 acres added and not lost. The watersheds are a Dominion-Provincial responsibility, with the Dominion obligated to carry the larger load of the cost. We have reached a clearly-marked crossroads. We either recognize the forests in their relation to the whole economy, and act accordingly, or we can shuffle along, every man for himself, each of us without conscience for his neighbor's grandson, and if the gods threaten punishment we can call in Rainmaker Hatfield."

Shortage of Bushworkers

According to the National Employment Service of the Federal Department of Labor there is still a demand for no fewer than 23,000 bushworkers in lumber and pulpwood cutting camps, of whom 14,000 are called for in the province of Quebec alone. An intensified campaign to get these workers into the woods for the balance of the cutting season is now under way, and large advertisements calling for them are being run in the newspapers, which state, "Physically fit men who have suitable clothing for this open air work, here is your opportunity to make good money before Spring." Canvassers for the various pulp and lumber companies are also active in the rural districts.

Quebec Forestry Association

The Quebec Forestry Association, which has been doing a remarkable work in promoting active participation by rural communities in forest conservation, has just held its 8th annual general meeting in Quebec. The treasurer's report showed finances to be in good shape, with a substantial surplus on hand. J. D. Brule, of Val Brillant, was re-elected president for

(Continued on page 26)

Strathmore Elects G. E. Williamson

SPRINGFIELD, Mass., February 9, 1946—At a meeting of the Board of Directors of Strathmore Paper Company this week George E. Williamson was elected to the presidency of the company, succeeding John D. Zink. Mr. Williamson has been with Strathmore for 34 years in various executive capacities. He joined the company in 1911 as chief engineer, became assistant to the president in 1926, treasurer in 1928, and vice-president and treasurer in 1942.

Mr. Williamson also is president and director of Premoid Products Incorporated, West Springfield, president and director of Agawam Chemicals Inc., West Springfield. He has served in various capacities with business and trade associations. He has served as president of the Technical Association of the Pulp and Paper Industry, and as a member of the Board of Directors of the National Association of Manufacturers. At present he is a member of the executive committee of the Associated Industries of Massachusetts and vice-chairman for the New England Region of the National Council for Stream Improvement.

The Strathmore Board of Directors also elected F. Nelson Bridgham Treasurer of the company. Mr. Bridgham joined Strathmore in 1910, was elected assistant treasurer in 1928 and vice-president in 1942. He is also treasurer and director of Premoid Products Inc., president of Day Lumber Corporation, Springfield, and director of West Springfield Trust Co.

Other officers of Strathmore Paper Company are—H. A. Moses, chairman of the board; C. M. Bryan, vice-president in charge of production; A. E. Shattuck, vice-president and assistant treasurer; and Bradley E. Stafford, clerk of the corporation.

Mr. Williamson announces that there will be no change in Strathmore policies for the future. The company objectives will be—to improve papers as rapidly as raw materials, craftsmanship and scientific progress permit; to render maximum service and cooperation to merchants; to increase productive capacity to the limit to meet today's urgent market demands for paper; and to continue mill-brand advertised lines.

Paper Art to Expand

INDIANAPOLIS, Ind., February 4, 1946—Revised plans for a $350,000 expansion program of the Paper Arts Company here, which will include two new factory buildings, an office structure and completion of a large warehouse now under construction, have been announced. The company, now located at 1005 North Meridian street, will build the new structures on a 19-acre plot of land at Arlington avenue and 34th street, acquired by the firm almost a year ago. The warehouse, 60 to 200 feet of concrete construction, will be completed within 60 days and other buildings are expected to be ready by late fall. The company will move from its present location when the expansion program is completed.

The first factory building will be 160 by 200 feet and the office building 20 by 200 feet. The last factory building to be constructed will be 200 feet square. All of the buildings will be air conditioned and have automatic control oil heating units. The company manufactures napkins, plates, cups and similar paper items and has an extensive foreign trade in addition to domestic business.

Hint at Mead-Columbian Merger

LYNCHBURG, Va., February 9, 1946—It was learned from authoritative sources here today that negotiations are pending before SEC for the acquisition through merger of the Columbian Paper Company at Buena Vista and Bristol by the Mead Corporation, which operates plants in Lynchburg and has headquarters at Chillicothe, Ohio. According to the Associated Press, stockholders of Columbian have been offered, subject to SEC approval, the exchange of one-half share of Mead $5.50 cumulative preferred stock, series B, and one share of Mead common stock for each share of Columbian they now possess.

A spokesman for the Columbian firm was quoted as saying action by the government agency is expected by the end of this month.

"Whether Columbian—which is said to represent an investment of between one and two million dollars—will be absorbed entirely by the much larger Mead Corporation, or rather will be operated as a subsidiary will depend," the spokesman said, "on whether a full exchange of stock is consummated."

Officers of the Columbian Paper Company are: Howard Thumbower, president, Buena Vista; F. W. Ancona, vice-president, Pottstown, Pa.; J. Frank Key, vice-president and general manager, Buena Vista, and M. D. McKee, secretary-treasurer, also of Buena Vista.

Columbian employs more than 225 persons at its Buena Vista plant and more than 175 at Bristol, turning out daily 95 tons of soda pulp and approximately 35 tons of book paper.

Union Bag Buys in Jacksonville

JACKSONVILLE, Fla., February 9, 1946— The Union Bag & Paper Bag Company, of New York, this week purchased approximately 100 acres of wooded land in the north side of Trout River east of Main street. Officials of the firm were quoted by a local newspaper as saying in New York that they had no present plans for the use of the property, which faces almost one mile on Trout River and extends to the St. Johns River.

As noted, the company has a plant in Savannah, and persons interested in the acquisition of the land said they believed the company will eventually erect a plant on the site.

Purchase price for the site was not revealed. It was bought by a land holding company in several parcels and later title was transferred to the paper company. Part of the site includes some of the Broward estate, a landmark at the north end of Jacksonville.

Manistique Will Produce Wallpaper

MANISTIQUE, Mich., January 30, 1946—The Manistique Pulp & Paper Co., has discontinued the production of newsprint to engage exclusively in production of wallpaper, according to R. G. Hentschell, general manager of the mill. Production of wallpaper will not, however, get under way unti April because new rewinding equipment must be installed.

Hinde-Dauch Pfd. Convertible

Hinde & Dauch Paper Company $4 cumulative preferred stock at $105.63 a share on February 25. Stock is convertible into common stock until February 25 at the rate of three and one-half shares of common stock for each share of preferred.

9 out of 10 are Automatic

HERE ARE A FEW OF THE MANY USERS!

ALL INDUSTRY

RAILROADS

Baltimore & Ohio R. R.
Chicago, Milwaukee, St. Paul & Pac. R. R. Co.
Illinois Central System
New York Central System

CERAMICS

Hazel-Atlas Glass Co.
Johns-Manville Products Corp.
The Glidden Co.
U. S. Gypsum Company

RUBBER

Goodrich Rubber Co.
The Goodyear Tire & Rubber Company
Kelly Springfield Tire Co.
U. S. Rubber Co.

FOOD

Armour and Company
Campbell Soup Company
The Cudahy Packing Co.
General Foods Corporation
Heinz, H. J. Co.
Kellogg Co.
Kraft Foods Company
Kroger Grocery & Baking Co.
Libby, McNeill & Libby
Lipton, T. J. Inc.
Swift & Company
Wrigley, Wm. Jr., Co.

PRINTING

Brown & Bigelow
The Cuneo Press, Inc.
Meredith Publishing Co.
Rand McNally & Company
U. S. Printing & Lithograph Co.

MACHINERY

Allis-Chalmers Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Elect. & Mfg. Co.

EQUIPMENT

Bendix Radio Div., Bendix Aviation Corp.
Dodge Manufacturing Corp.
General Bronze Corporation
National Cash Register Co.
Radio Corp. of America

TEXTILES

American Viscose Corp.
Cen-Tennial Cotton Gin Co.
Industrial Rayon Corp.

MANY HAVE FOUND TRANSPORTER

SAVES THE MAN...LIGHTENS HIS LOAD...TAKES THE WORK OUT OF A JOB

CONTROLS IN STEERING HANDLE

All movement of the Transporter is controlled by gentle touch of the hand and thumb. Operator simply rests his palm on the cross handle, applies easy thumb pressure to the button, and away goes a 6000-pound load at creeping or walking speed, forward or reverse. Simple as turning the ignition in a car, effortless as a pleasant walk.

POSITIVE MECHANICAL BRAKE

Again, operator has complete control of stopping as well as starting with absolutely no manual effort. The thumb is released, power automatically shut off, and Transporter comes to a gradual stop. Guide handle to vertical position and heaviest loads come to an instant stop. Everything is completely mechanical . . . nothing left to human error.

"DEAD-MAN" CONTROL

Day-dreaming, inattention or sudden distraction from work cannot endanger the operator or the load with Transporter "Dead-Man" Control. When the hand is taken off the steering handle, it flips back to its normal position, and the Transporter stops dead. It becomes inoperative *immediately.*

SHOCKLESS HYDRAULIC LIFT WITH EASY FOOT CONTROL

Simple foot pressure on almost ground level lever raises load to position for horizontal movement. No standing on lever, no straining of leg muscles. The load goes up gently, safely, evenly. Same easy foot pressure lowers load at any speed, without shock, without jar, without danger to the most fragile load.

● Today thousands and thousands of Automatic Transporters are in use the country over. As you can see from the partial list of users shown above, daily they haul anything and everything for every kind of business...have been doing so for years. Truly a miracle electric truck, it is the only one that is completely industry tested . . . the only one that has withstood the test of time.

It has built-in features that save the man . . . that end back-breaking human toil. It saves so much, that many have amortized its cost in four months or less. Let us show you how it happily combines advantages for both management and labor . . . how much it lightens life's loads. Mail the coupon for complete facts

***If it isn't* AUTOMATIC, *it isn't a* TRANSPORTER**

TRANSPORTERS...

RY IS USING THEM!

AUTOMOTIVE

Edw. G. Budd Mfg. Co.
Cadillac Motor Car Div. G.M.C.
Ford Motor Company
GMC Truck & Coach Div., GMC
International Harvester Co.
Mack Trucks, Inc.
Packard Motor Car Company
Stewart-Warner Corporation
The White Motor Company

CHEMICALS

Abbott Laboratories
The Dow Chemical Company
Du Pont de Nemours, E. I. Company
Monsanto Chemical Company
Parke, Davis & Company
Sherwin-Williams Co.
United Drug Company

METAL PRODUCTS

Aluminum Company of America
The American Brass Company
American Can Co.
Continental Can Company, Inc.
Crane Co.
National Lead Co.
Remington Arms Company, Inc.
Simmons Co.
SKF
Timken Roller Bearing Co.
Worthington Pump & Machinery Corp.

STEEL

Acme Steel Company
American Steel Foundries
Bethlehem Steel Co.
Carnegie Illinois Steel Corp.
Jones & Laughlin Steel Co.

PAPER

Container Corporation of America
Crown Zellerbach Corp.
Dennison Manufacturing Company
Eastman Kodak Company
Gaylord Container Corporation
Hoco Envelope Company

OTHER INDUSTRIES

American Tobacco Co.
Canada Dry Ginger Ale, Incorporated
Carrier Corporation
The Detroit Edison Company
Endicott Johnson Corporation
The Globe-Wernicke Co.
Long Bell Lumber Co.
P. Lorillard Co.
Pullman Standard Car Mfg. Co.
Spiegel, Inc.
Underwood-Elliott-Fisher Co.

CUT HANDLING COSTS IN HALF!

FRONT WHEEL POWER DRIVE

This feature permits the Transporter "to turn on a dime." It gives complete freedom in maneuvering sharp corners and making turns in narrow aisles. It will turn a full 210 degrees with constant power. All Transporters have this Front Wheel Power Drive. Back Wheel Power Drive Trucks can't begin to provide such time and energy-saving "turnability."

LOWEST OPERATING COST

The Transporter is the only material handling electric truck that provides maximum power for a full day's hauling and yet uses only an ordinary light socket for 8 hour recharging. Current costs is 10c to 11c a day based on an electric current cost of 2c a kilowatt hour. Again, no other electric truck can approach such economy in battery, charger and current cost.

Transporter
A PRODUCT OF AUTOMATIC
Lightens LIFE'S LOADS

AUTOMATIC TRANSPORTATION CO.
Div. of the Yale & Towne Mfg. Co.,
79 West 87th Street, Dept. B, Chicago 20, Ill.

Please send me complete information about Transporter, the miracle electric truck, and how it can cut my material handling costs in half.

Company Name.....

By.....Position.....

Street Address.....

City.....State.....

Kalamazoo Mill Expands Business

Prospects of expanding business, with equipment that has been idle for three years or more, as in other paper mills, again producing, were outlined by George T. Jubb, president of the Kalamazoo Paper company at the annual meetings. The sessions were held in the directors' rooms of the First National Bank and Trust Company. All officers and directors were re-elected.

Jubb said that one machine in No. 2 plant in which both machines had been down for more than three years, was started in December, and that extensive improvements to permit more efficient operation are being planned in the immediate future in the power plant. Other improvements in the production end of the company are under consideration, to be started as soon as conditions permit, and warrant the move.

Sales for 1945 were $6,774,626, slightly under the 1944 mark, it was noted, and gross profits were $609,238.34. With $250,000 deducted for federal taxes the net profit for the year was $359,238.34 or $1.09 per share. Of these earnings, 60 cents per share was paid in dividends.

Directors re-elected are A. E. Curtenius, George T. Jubb, Bert H. Cooper, James A. Wise, F. B. Curtenius, Charles S. Campbell, A. B. Connable, Sr., C. Hubbard Kleinstuck, Woodbury Ransom, Sherwood Waldron and W. K. Wallace, the last two from New York City.

Officers are George T. Jubb, president; James A. Wise, vice president in charge of production; Bert H. Cooper, vice president and purchasing director, and F. B. Curtenius, secretary-treasurer.

St. Maurice Valley Appoints Sherman

MONTREAL, P. Q., February 11, 1946—D. W. Sherman has been appointed commercial vice-president of the St. Maurice Valley Paper Company Limited. Mr. Sherman has been associated with the newsprint industry of Canada since 1912 when he joined the staff of the Laurentide Company after graduating from Yale University. After serving in the United States Army, he returned as captain and resumed his work at Grand'Mere, Canada. He has a wide and international experience in the selling of newsprint and other products and has travelled extensively in the interests of the company.

Mr. Sherman lives at Bronxville with his wife, daughter and son, John Sherman, who recently returned from service in the Pacific. Mr. Sherman's family in Glens Falls, N. Y., was long associated with forest industries in the State of New York.

Witham Joins Bristol As Consultant

HUDSON FALLS, N. Y., February 11, 1946 — George S. Witham has become associated with The Bristol Company, Waterbury, Conn., as consultant on development and sales in the Pulp and Paper Instrument Division.

A graduate of Lawrence College, Appleton, Wis., Mr. Witham has been continuously connected with the pulp and paper industry during his whole business career. His apprenticeship started with Hollingsworth and Whitney Company, Waterville, Me. He has been associated, in various engineering and management positions, with many paper mills throughout this country, in Canada, and in Mexico. He was co-author with his father, G. S. Witham Sr., of the book *Modern Pulp and Paper Making.*

Toilet Tissues Short in Indiana

INDIANAPOLIS, Ind., February 8, 1946—In spite of wide-spread strikes unemployment in this territory the demand for all sorts of paper continued last week with supplies restricted. Perhaps the greatest shortage of the week resulted in toilet and cleaning tissues. The former was virtually off the market. The situation has become so acute that some of the hotels, who buy directly from the local jobbers, are in a quandary as to what to do. Some of them were forced to visit the variety, grocery, department and other stores and with their demands yet unfilled they still are faced with a problem. For a time it seemed that cleaning tissue supplies were improving, but the last week or so has found the situation even more complex than ever.

Demand for fine paper also continued heavy and consumers are having to await their turn in the filling of orders.

Box factories report they have been able to catch up somewhat with back orders, due to curtailment of considerable industry here because of the steel and automobile strikes, but the demand is beyond what they expected in view of conditions. They predict that when the local plants all return to work, the situation will be as bad as ever. The factories continue to suffer from lack of raw materials, but the labor situation is easing somewhat. Practically all are at capacity production.

With spring just around the corner, the building paper and roofing distributors are expecting a sharp increase in demand. Lack of other building materials will curtail new construction and remodeling, but every effort is being made here to solve this problem. It is certain the roofers will have more volume than they had last spring, for the work already is in sight.

Newsprint demand continued heavy with advertising more than average for this season. Waxed papers and cellophane also were much wanted with prices strong.

Wadleigh Enters Consulting Field

George R. Wadleigh, who for twenty-four years was manager of the engineering department of West Virginia Pulp and Paper Company, is entering the consulting engineering field in the pulp and paper industry. Having reached the retirement age under the excellent plan recently set up by the West Virginia Pulp and Paper Company, Mr. Wadleigh severed his connection there as of October 1, 1945.

Mr. Wadleigh for ten years was manager of the engineering department for Bemis Brothers Bag Company of Boston and St. Louis. He left Bemis Brothers to join West Virginia.

He has been for twenty-five years a member of the Technical Association of the Pulp and Paper Industry, for several years was a member of its Finance Committee, and has been active on many of its other committees. He is also a member of the American Society of Mechanical Engineers, the Engineers' Club of New York, and the Technology Club of New York.

Loudenslager and Lueckel Return

PHILADELPHIA, Pa., February 11, 1946—Two veterans with impressive service records recently resumed peace-time activities with the Garrett-Buchanan Company. Major R. E. Loudenslager, in less than four years, rose from private. Lt. Robert Lueckel also enlisted as a private and rose to his commission in the Army Air Corps.

Rosin Curbs Removed

WASHINGTON, D. C., February 13, 1946—All quota limitations on consumption of rosin have been lifted, the Civilian Production Administration announced today. The action was effected by amendment of Order M-387.

Increased production of wood rosin is expected shortly, CPA said. The first of the new gum crop should reach the market late in April.

Rosin is used in manufacture of paper and paperboard, soap, paint, varnish and lacquer, synthetic resins, rubber and rubber goods, including synthetic tires; also in cements, printing inks, and other manufactured products.

Consumption restrictions on rosins have been lifted for two reasons. The stocks of gum producers, which normally decrease during the fourth and first quarters of the calendar year, have shown a slight rise during these quarters. In addition, the soap industry, one of the largest consumers of rosin, will be unable materially to increase its consumption of rosin because of inadequate oil supplies. This places an economic pressure on the gum producers because they have been required to hold large stocks.

The amendment places rosin under the general restrictions of Priority Regulation 32. At the end of February it is expected that this reference will be removed by an amendment to PR-32.

In order that consumption and supply figures may be available it will be necessary for consumers to continue to file with CPA the quarterly reports on consumption and inventories on CPA-4131. Also, limitation of exports of rosin will be continued until such time as it has been established that domestic requirements will be adequately provided for.

It is estimated that stocks as of December 31, 1945, totalled 455,000 drums as against 572,000 drums December 31, 1944. It is believed that the winter production of wood rosin will be sufficient so that the United States stocks in the hand of consumers and producers as of April first will be in the neighborhood of 400,000 drums. Stocks below that point would be inadequate in the national economy, CPA said, and it is hoped that the new crop production plus new output of plants now under construction will take care of domestic requirements from now on.

Schroeder Forms Sales Group

Contracts and spot orders already accepted and acknowledged by the Pejepscot Paper Company recently bought by Hearst interests, will be fulfilled, and all details in connection with those contracts and orders will be handled in the future by a separate independent sales organization known as the Arthur Schroeder Paper Company, located at 420 Lexington Avenue. The new sales company is headed by Arthur Schroeder, formerly Pejepscot president and sales manager.

Phee Refreshes His Memory

HOLYOKE, Mass., February 4, 1946—Thomas H. Phee, before the war a member of the Chicago staff of Chemical Paper Manufacturing Co., is taking a refresher course at the Chemical Paper Co. to acquaint himself with the many changes that have taken place in the paper industry.

Phee was on the inactive list of the naval reserve and was called to service before the outbreak of hostilities and served until Sept. 22, 1945.

Saturday February 23rd at 9:30 P.M. EST., over the

A Tribute to America's Great

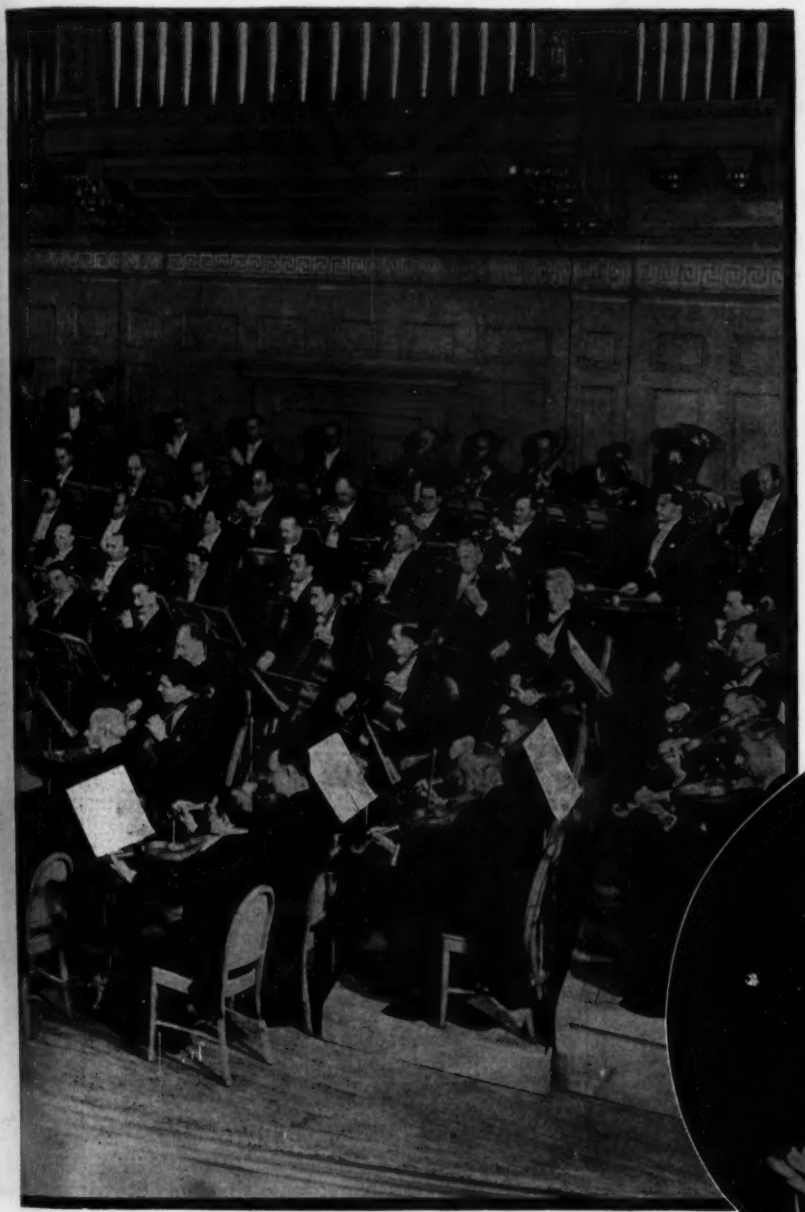
PULP AND PAPER INDUSTRY

In appreciation of its Many Great Contributions to American Good Living!

Another Tribute to Industry by ALLIS-

Producer of the World's Largest Line of

American Broadcasting Company (COAST-TO-COAST)



Tune in the World-Famous

BOSTON SYMPHONY

RADIO BROADCAST

Serge Koussevitzky

CONDUCTOR

Hear the World's Finest Music by the World's Finest Concert Orchestra. Consult your local paper for time and station.

CHALMERS

Major Industrial Equipment

Listen to the Boston Symphony over the air *every* Saturday night . . . Sponsored for the 3rd Season by Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

A 1947-E

FOR BANNER PAPER SALES
IN THE VERY HEART OF
INDUSTRIAL AMERICA . .
SELL THROUGH
The Central Ohio
Paper Co.
PAPER MERCHANTS
AND CONVERTERS
SINCE 1875
DETROIT
TOLEDO
CLEVELAND
PITTSBURGH
INDIANAPOLIS
COLUMBUS
DAYTON
CHARLESTON
Accepted in this area for 70 years as steady, reliable suppliers of paper products, we enjoy a rich market for sales. We convert large quantities of envelopes and school supplies. We also laminate, coat or impregnate paper, cellulose film, foil, acetate, cloth and similar materials.
This continued growth and recognized leadership in the richest industrial area in the world, qualifies us to do a sales job for you. From our purchasing office in Columbus, through eight warehousing divisions a vigorous sales staff bears the banner of quality and integrity to receptive consumers.
THE CENTRAL OHIO PAPER COMPANY
226 NORTH FIFTH STREET - COLUMBUS 16, OHIO
Detroit Cleveland Pittsburgh Dayton
Indianapolis Toledo Charleston

More Workers Needed in Woods

TORONTO, Ont., February 11, 1946—While the Lumber and Sawmill Workers' Union, are complaining that German prisoners of war are being exploited to the disadvantage of Canadian workmen, and while rehabilitation committees are pointing out that Canadian workmen are walking the streets, the lumber companies in the Port Arthur district reply that they cannot get other workers if they open up the jobs by releasing the Germans. The timber companies point out that, in the first place, the ordinary returned soldier does not want to go to the isolation of the woods and furthermore he is not skilled at that type of work. Hundreds of men who formerly worked in the woods are no longer to be found. A timber operator, asked for his explanation of the disappearance of the former woods workers, gave several reasons. Some are now too old. Some have found other employment. Some have gone onto farms of their own and others, having had a taste of city life while working in war plants, are not now content to return to the woods. An estimate is that only 10% of those in the timber camps of Thunder Bay district before the war are there now. Meanwhile, the operators are advertising for 1,500 men in this area alone. Operators claim that while the general unemployment in the area may justify the claim that no more men are needed in the area, at the same time, the unemployed cannot be attracted to the woods and remain in the cities and towns. Jack Quinn, speaking for the union, said: "With all the larger companies employing from 50 to 75% prison labor, it is difficult for local men to secure employment in remaining lumber camps." The timber companies state that every capable workman can have a job quickly and only a few are to be found.

Norman E. Wainwright Dead

TORONTO, Ont., February 11, 1946—Norman E. Wainwright, 59, former wartime prices and trade board adminstrator of paper converted products, died February 6, at Toronto General Hospital. Born in Liverpool, England, Mr. Wainwright came to Toronto in 1910. From 1928 to 1940, he was president of the Don Valley Paper Co., Toronto and Buntin-Gillies, Ltd., Hamilton. At the time of his death he was president of Toronto Envelope Company. He had also been connected with the Provincial Paper Mills, Ltd., and Howard Smith Company. He was a member of Toronto Hunt Club. Surviving are his widow, a daughter and a son.

William Oliphant

HOLYOKE, Mass., February 4, 1946—William Oliphant, retired foreman of the finishing department of the Carew Manufacturing Co., died suddenly Jan. 28 from a heart attack. He was 83 years old. Only survivors are nieces and nephews.

Fernand Arsenault

HOLYOKE, Mass., February 4, 1946—Fernand Arsenault, 21, who received third-degree burns while working at the Crocker-McElwain Paper company last Sunday, when he backed into an open switchboard, died at Providence hospital. He had been discharged from the navy on December 20 after serving 42 months on a destroyer and taking part in five major engagements.

BRONZE VALVES with a Pedigree

The Powell Line of Bronze Valves for controlling intermediate steam, oil, water and gas is not an overnight development. Rather, it is a result of evolution through Powell's 100 years of practical, scientific progress in the art of valve-making.

Starting in the first generation with the celebrated "Star" Regrinding Globe Valve, invented and patented by James Powell, each succeeding generation of the Line has produced better and better valves. Today the nation-wide performance of Powell Bronze Valves definitely stamps them as "Valves with a Pedigree."

Valves of Special Interest to the PULP and PAPER INDUSTRY will be exhibited at our BOOTH 54 20th Exposition of Chemical Industries Grand Central Palace, New York February 25 to March 2, 1946

Fig. 150

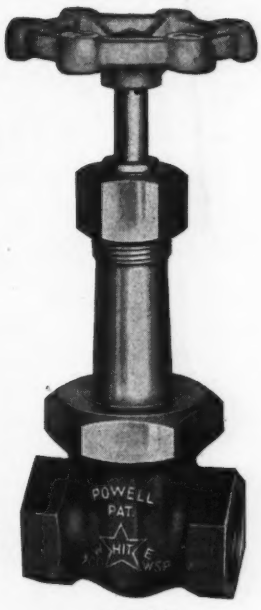


Fig. 375

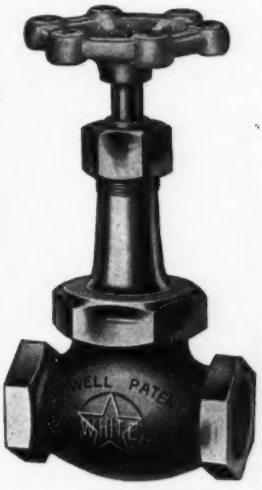


Fig. 1708

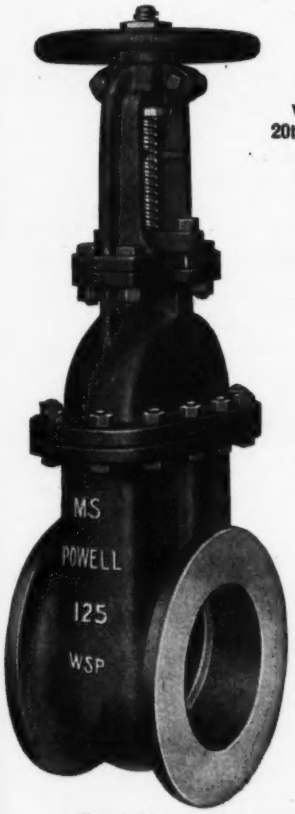


Fig. 1414

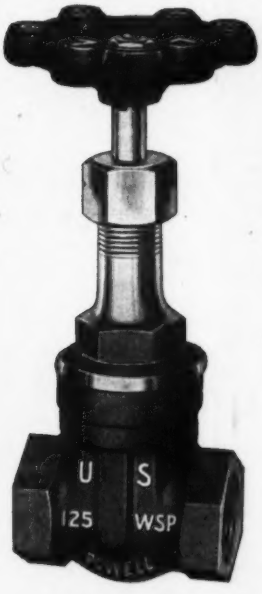


Fig. 500

Fig. 1414—125-pound Bronze O. S. & Y. Gate Valve with flanged ends.

Fig. 500—125-pound Bronze Gate Valve with screwed ends, inside screw rising stem and screwed bonnet.

Fig. 1708—200-pound Bronze Globe Valve with screwed ends, inside screw rising stem, union bonnet, renewable seat and regrindable, renewable wear resisting semi-cone plug type disc.

Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable wear resisting seat rings and disc.

Fig. 150—150-pound Bronze Globe Valve with screwed ends, union bonnet and renewable composition disc.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

POWELL VALVES

Leading the Parade

• Starches, Gums, Syrup and Dextrines made by CORN PRODUCTS solve many manufacturing problems. CORN PRODUCTS technical staff is at your service to assist you in making efficient, economical use of these fine products.

Corn Products Sales Co.

17 BATTERY PLACE, NEW YORK 4, N. Y.

PULP RESEARCH LEADS IN CANADA

(Continued from page 14)

the ensuing year, and other officers elected were: vice-presidents, Roland Bock and V. E. Johnson, both of Montreal; treasurer, Henri Kieffer, chief of Forestry Protection Service, Quebec; manager, J. A. Breton, Quebec; new directors, Wilfrid Hamel, Paul Sauve, Emile Lemire and M. H. Magnan, of Montreal. An executive meeting voted to name two new regional directors.

The Association has announced that the annual forestry contests which it sponsors will be held this year in the Eastern Townships and in the counties of Levis, Lotbiniere, Nicolet and l'Assomption. All 4-H Clubs (youth forestry bodies sponsored by the Association) which have reforested from one to 10 acres of land, exclusive of maple trees, are eligible for junior contests, while all owners of 10 to 300 acres of woodland, exclusive of maple trees, may enter senior contests.

New Zealand Launches Paper Industry

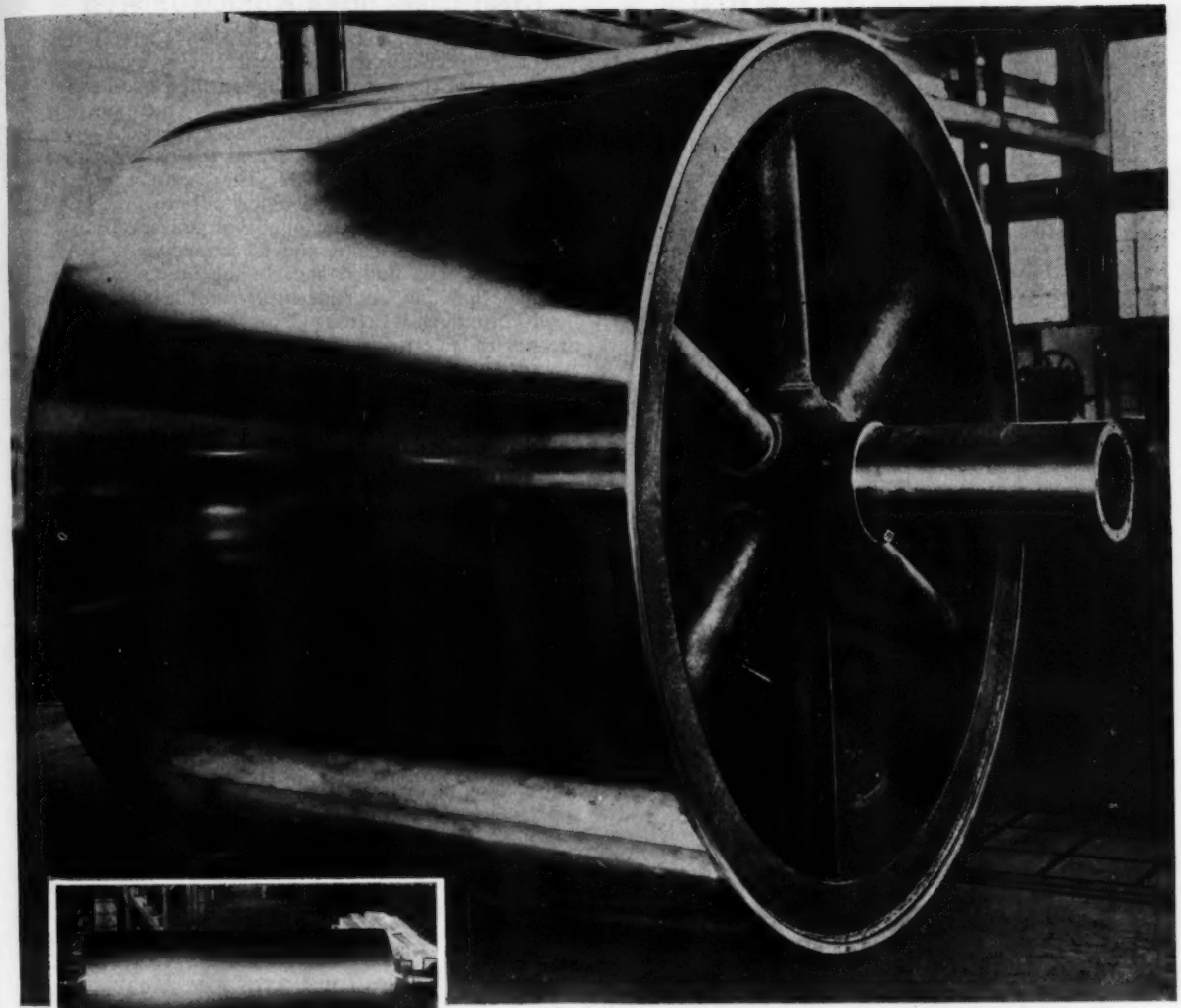
The Department of Trade and Commerce at Ottawa announces that New Zealand is launching an industry for the manufacture of kraft pulp and paper from native timber. This follows a favorable report by officers of the New Zealand Forests Products Limited, who recently examined paper mills here and in the United States and had tests of New Zealand timber made in American mills. The site for the proposed new mills has been chosen, and some of the plant is on order. The estimated cost is between one and one and a quarter million pounds sterling. There is a ready demand in New Zealand for kraft pulp to feed the one mill now operating and to supply the additional mills to be created, the Department reports. The increasing use of fiber and corrugated board boxes for the packing of butter, owing to the diminishing supplies of local lumber for butter boxes, has shown that substitute material must be used to a greater extent or more lumber imported. Another use for kraft paper that will be developed is in the manufacture of multi-wall bags for cement.

Pact With Mexico

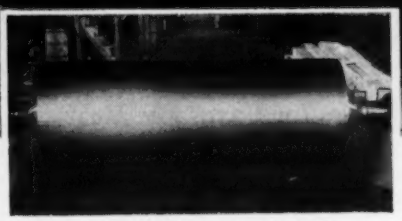
Canada and Mexico have signed a commercial treaty designed to increase trade between the two countries from a 1939 average of $3,500,000 to a yearly average of around $50,000,000. The treaty places the two countries on a "most favored nation" basis in their trade relations—the same footing as with Canada and the United States. Canada's principal exports to Mexico include newsprint and wrapping paper, and it is expected these will be increased, as well as machinery and manufactured products. Of late Canada has been exporting about 15,000 tons of newsprint annually to Mexico. In return Canada will take more fruits and other agricultural products of Mexico, as well as jewellery and raw rubber.

New Celanese Plant

A plant extension of the Canadian Celanese Company Limited at Drummondville, Que., designed to produce 7 to 8 million lbs. of cellulose acetate annually, in addition to present production, is close to completion, and operations are expected to start early in the coming summer. The cost is estimated at $5,000,000. The acetate is to be converted into cellulose acetate stable and filament yarn, which will be available to other Canadian manufacturers.



Lukenweld Jacketed Drier Roll, 8′ 0″ in diameter, with a 6′ 10″ face, weighing approximately 17,685 lbs., for installation in a Yankee-type paper machine.



Lukenweld Jacketed Drier Roll, 2′ 8″ in outside diameter, 11′ 3⅜″ in overall length, with 7′ 6″ face.

A cut-away model of a Lukenweld Drier Roll will be on display at the Chemical Exposition —Booths 558 to 563—February 25 to March 2, Grand Central Palace, New York.

Higher Steam Pressures Higher Output . . . *with*

Lukenweld Steel Plate Drier Rolls of Double-Shell Construction.

Your inspection is cordially invited

LUKENWELD, INC.

311 Lukens Building — *Division of Lukens Steel Company* — Coatesville, Pa.

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending February 9, 1946

STOCKS

	High	Low	Last
A. P. W.	10¾	9¾	9¾
Armstrong Cork Co.	57	55½	56½
Celotex Corp.	25⅝	24¼	25½
Celotex Corp., pf.	21½	21¼	21¼
Certain-Teed Products Corp.	17½	16⅞	17⅛
Certain-Teed Products Corp., pf.	109¼	109¼	109¼
Champion Paper & Fibre Co.	51	50	50¾
Champion Paper & Fibre Co., pf.	113	113	113
Congoleum Nairn Co.	36½	34¾	34¾
Container Corp. of America	44⅜	43¼	43¾
Continental-Diamond Fibre Co.	18⅜	16¾	17⅜
Crown-Zellerbach Co.	35	31¾	34¼
Crown-Zellerbach Co., pf.	110¾	109	109
Dixie Cup Co.—A	55⅜	54¾	55½
Dixie Cup Co.	46	45	46
Flintkote Co.	39½	38¾	39¼
Flintkote Co., pf.	114	113	114
Robert Gair	11⅝	10⅞	11⅛
Robert Gair, pf.	20⅛	19¾	20
International Paper Co.	45¾	43	44⅞
International Paper Co., pf.	120¾	118¼	120½
Johns-Manville Corp.	154	146½	146½
Johns-Manville Corp., pf.	141	140	140
Kimberly-Clark Corp.	64¾	61½	61½
Mac Andrews & Forbes	40¾	40	40
Mac Andrews & Forbes, pf.	...	...	...
Masonite Corp.	61½	60¼	60¼
Mead Corp.	24½	23¾	23¾
Mead Corp., pf. A—6%	106	105	106
Mead Corp., pf. B—5½%	106	106	106
National Container Corp.	27¾	27⅛	27¾
Paraffine Companies, Inc.	83	81	82
Paraffine Companies, Inc., pf.	...	...	...
Rayonier, Inc.	27¾	25¼	25⅝
Rayonier, Inc., pf.	38½	37½	38
Ruberoid Co.	50¾	49	49
Scott Paper Co.	56¾	56	56¼
Scott Paper Co., pf.	107½	107½	107½
Sutherland Paper Co.	39½	39	39
Union Bag & Paper Corp.	26½	25¼	25¾
United Paperboard Co.	12¾	12⅛	12¼
U. S. Gypsum Co.	119	116	116
U. S. Gypsum Co., pf.	204	204	204
West Virginia Pulp & Paper Co.	43¾	41	41
West Virginia Pulp & Paper Co., pf.	114½	114	114

BONDS

Abitibi Pulp & Paper Co. 5s '53	107	106⅝	107
Celotex Corp. 3¾s '55	...	...	...
Certain-Teed Products Corp. 5½s '53	...	...	...
Champion Paper & Fibre Co. 3s '65	...	...	...
International Paper Co. 6s '55	105⅞	105⅞	105⅞
International Paper Co. 5s '47	103⅞	103⅞	103⅞
Mead Corp. 3½s '53	...	...	...

New York Curb Exchange

High, Low and Last for Week Ending February 9, 1946

STOCKS

	High	Low	Last
Great Northern Paper Co.	43½	43¼	43¼
Hummel-Ross Fibre Corp.	13½	13⅛	13¼
St. Regis Paper Co.	11⅜	11⅛	11¼
St. Regis Paper Co., pf.	...	...	...
Taggart Corp.	9⅞	9⅝	9⅝

BONDS

American Writing Paper Co. 6s '61	104⅜	104⅜	104⅜

Michigan Paper Re-elects Officers

PLAINWELL, Mich., February 11, 1946—Michigan Paper Company stockholders, at their annual meeting filled the vacancy on the board of directors, caused by the death of Lewis H. Kirby, with the election of Merrill W. Taylor.

Other directors were re-elected, and the directors returned all officers to their positions. The other six directors are William J. Lawrence, Jr., George A. Pelgrim, Holland; H. C. Jackson, Dwight L. Stocker, W. E. Stone, Allegan, and C. J. Woodhams, Plainwell. The officers are Dwight L. Stocker, president and general manager; H. C. Jackson, secretary; C. A. Braginton, treasurer, and Frank L. Brown, assistant secretary and assistant treasurer.

Stocker reported that all three machines are now in operation, but that one will go down soon to undergo a thorough overahuling and rebuilding.

Price ceilings operated, said Stocker, to reduce earnings for 1945 below the level set in 1944. From sales totalling $2,160,952 in 1945, net earnings of $47,150.94 were realized, Stocker reported, of which $30,000 had been paid out in dividends.

Great Lakes Stock Attracts Interest

TORONTO, Ont., February 11, 1946—There is considerable speculation in financial circles concerning the nature of the possible change in the capital structure of Great Lakes Paper Company, mentioned in last week's issue. Great Lakes Paper Class "A" preferred jumped over $7 a share in the past week, to 52½, a new high since 1937. The common jumped $6.50 a share to $30.50, double its 1946 low price. The whole question of a capital reorganization is still in a very nebulous state, and no immediate action is anticipated, it is understood. In the first place, it is doubted that any announcement will be made until bond refunding is arranged and outstanding bonds are not callable prior to October 1, 1946. Secondly, any plan would require the agreement of 75% of the stockholders. With the voting trust agreement under which 90% of Class "A" and 80% of the common shares are deposited, expiring on June 1, 1946, it seems doubtful that the voting trustees would be very keen to vote on any reorganization plan unless it became absolutely necessary, because of other considerations, it is pointed out. At present there are only two trustees—Rt. Hon. Arthur Meighen and J. H. Ratcliffe—as the late A. D. Cobban has not been replaced. Further, as the present Great Lakes Paper Company was formed in 1936 by a court order, there will be a lot of "red tape" involved in changing its capital setup. One unofficial report suggests cancellation of arrears on Class "A" $2 preferred and its exchange for new $2.50 preferred, having a high enough call price to compensate for loss of arrears. Also rumored is elimination of Class "B" preferred, now held by the trustees for the newspaper publishers, and its arreas, in return for a long-term newsprint contract to run for 10 years and be renewable for 10 years. Another report, which is pretty well discounted, suggests an agreement with Minnesota and Ontario Paper Company. No official statement has been made.

KVP Looks for Favorable Year

KALAMAZOO, Mich., February 8, 1946—With operations restricted by shortages of material and labor, selling prices held at 1942 levels, and increases in the cost of pulp and coal, 1945 presented a marked contrast to the prospects of 1946. Ralph A. Hayward, president, told stockholders of the Kalamazoo Vegetable Parchment Company at the annual meeting Monday afternoon in the Parchment community house.

There was a substantial decrease in profits in 1945, he reported, due to the restrictions, but 1946 opens with ample employment for the work in hand and prospects favorable for a good year. The stockholders returned all directors to office, and the directors in turn re-elected all officers.

In the Espanola plant remarkable progress has been made, Hayward stated, with machinery and equipment being installed and men working in the woods getting out lumber for the pulp plant. He reported that a Canadian company will be established by the first of April and the plant is expected to be in operation by June.

The company's report showed that net sales totaled $13,761,134 in 1945, which gave an operating return of $431,318, but which other deductions cut to $312,537 profit before taxes on income. An estimated claim for refund on income taxes of $320,000 brings the net profit figure for 1945 to $516,537.

I.P.C. Signs New Contract

HUDSON FALLS, N.Y., February 11, 1946 — A conference held last week between representatives of the International Brotherhood of Papermakers and officials of the International Paper Company resulted in a general wage increase of ten cents an hour covering several thousand employes of the book and bond division, besides bringing the base hourly wage for men to 85 cents and women 77 cents. The increase affects branches of the firm located at Palmer, Ticonderoga, Niagara Falls, North Tonawanda, N. Y., Livermore Falls, Me., Yorkhaven, Pa., and South Glens Falls. An increase of five cents an hour was granted at a conference last November but the later raise is intended to compensate for the post-war return in hours from the forty-eight hour schedule to the present forty hours per week. The company also agrees to pay time and a half for work on Memorial Day, Thanksgiving and New Year's Day in addition to overtime for Sunday and over the forty-hour-week schedule. Christmas, July 4th, and Labor Day are to be paid holidays.

Among the labor representatives who participated in the conference were Matthew Burns, president of the International Brotherhood of Papermakers, John P. Burke, president of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, and John Evual, representive of the International Brotherhood of Firemen and Oilers. The company was represented by S. E. Kay, manager of manufacturing; A. G. Stone and W. E. Maxim, division managers; George J. Adams, industrial superintendent; O. B. Beyer, Palmer; J. J. Lawson, Ticonderoga; T. G. Mangan, Livermore Falls; H. P. Bailey, Niagara Falls; J. W. Youngchild, North Tonawanda, and R. A. Masten, Yorkhaven.

Gun-fil for Industry

Manufacturing rights on Gun-Fil Lubricators have been acquired by the Gray Company, Inc., 60 11th Ave. N.E., Minneapolis 13, Minnesota, manufacturers of lubricating equipment. Gun-Fil Lubricators are now in production as part of the Gray Company's industrial line of lubricating and maintenance equipment.

Designed in four sizes, pressure filled Gun-Fil Lubricators automatically dispense oil or grease to a moving bearing, and stop feeding lubricant when a bearing becomes motionless.

Six interchangeable valves are available with distinctive colored caps for identification. The valves with colored caps exert varying degrees of control of feed on greases of different densities.

Panelyte to St. Regis Sales

Sales operation of the Panelyte Division of the St. Regis Paper Company hereafter will be conducted through the company's wholly-owned subsidiary, St. Regis Sales Corporation, it has been announced. The change will not alter Panelyte's established policies or customer relations, but merely consolidates selling activities.

Panelyte Division is represented in the management of the sales corporation by C. R. Mahaney, executive vice president; P. P. Ryan, vice president; W. Kops, sales promotion manager, and district sales managers with offices in these cities: D. F. Sweet, Trenton; V. L. Kiernan, New York; C. C. Stokes, Boston; R. C. Prall, Cleveland; R. A. Laragh, Syracuse; G. I. Gee, Detroit; N. J. McCurdie, Chicago; and R. Z. Emig, Cincinnati.

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The Model "E" Undercut meets the needs of the modern finishing department for high production, accurate trimming and safe operation.

Investigate the new Model "E" for your peacetime needs. Bulletin giving full particulars mailed on request.

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Manufacturing Company
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Finch, Pruyn Grants Raise

GLENS FALLS, N.Y., February 9, 1946—Following the annual wage conference between labor representatives and officials of Finch, Pruyn & Co., several hundred employees will receive a wage increase of fifteen cents an hour, retroactive to the first week in February. The increase brings the company's minimum base rate to eighty-five cents an hour. Continuing the harmonious relations which have existed for many years between the management of Finch, Pruyn & Co. and its employees, the agreement extends to May 11, 1947, one which is now in effect, amended by the wage increase. It was also agreed that the firm would pay time and one half for toil on Memorial Day, Thanksgiving and New Year's Day. These are not designated as holidays, however, as the firm intends to operate. Operations are suspended only on the Fourth of July, Labor Day and Christmas for 32, 24 and 40 hours, respectively. An official of the International Brotherhood of Pulp, Sulphite & Paper Mill Workers described the wage increase as the largest ever negotiated by the union with the company. The latter was represented at the conference by Maurice Hoopes, president, and Samuel Pruyn and H. F. Bullard, vice-presidents. Among the labor representatives were Frank L. Barry, vice-president of the International Brotherhood of Papermakers; John P. Burke, president of the International Brotherhood of Pulp, Sulphite & Paper Mill Workers; Albert Tracey, president of the local branch of the International body, and others.

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RUBBER COVERED ROLLS
The precision grinding of a Cincinnati Rubber Covered Roll not only produces a crown of exacting dimension, but a smoothness that contributes much to the paper that passes through the press. Just feel the smooth cover and you know it's the work of expert craftsmen.
Send your next roll to Cincinnati for re-covering.
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CINCINNATI 12, OHIO

Adams Joins Stein, Hall

Stein, Hall and Company, Inc., has announced the appointment of Lt. Col. J. R. Adams as manager of the Development Department of its Technical Division. He served for five years in the Army Chemical Warfare Service in charge of incendiary bomb development and is on terminal leave until he receives his honorable discharge on March 28th. For ten years prior to the war he was associated with Old Colony Envelope Co. as a specialist in paper converting. He was active in the affairs of the Technical Association of the Pulp and Paper Industry and is well known in the paper and adhesive industries throughout the country. As manager of the Development Department he will take products as developed by Stein-Hall laboratories and pilot them through their plant test periods in the field until they are perfected and released for sale.

Reliance Promotes Helm

CLEVELAND, Ohio., February 11, 1946 — Edward E. Helm, general sales manager of the Reliance Electric & Engineering Company, has been elected sales vice president of the company, it was announced today by J. W. Corey, president following the regular meeting of the board of directors. All other officers were re-elected.

Helm has been with Reliance since he was graduated in electrochemical engineering from Pennsylvania State College in 1924. Subsequently, he managed both the Birmingham and Philadelphia sales territories, where he was particularly active in application engineering work in the steel, textile and paper industries. His appointment as general sales manager of the company was made in December 1944.

Helm is a member of the Association of Iron & Steel Engineers, the Engineers' Society of Pennsylvania and the Technical Association of the Pulp and Paper Industry.

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G-299T

Mando Establishes Scholarship

MINNEAPOLIS, Minn., February 11, 1946—A graduate scholarship for the Division of Forestry, University of Minnesota, to be known as the Mando Research Project, has been established by the Minnesota and Ontario Paper Company. This scholarship to which all students in the Division of Forestry are eligible, will be awarded for the first time this year and the recipient will benefit under it immediately.

The object of this research, R. W. Andrews, Mando, vice-president, declared, will be to study the different methods of slash disposal for the purpose of determining (1) the effectivenes of each in the reduction of fire hazard, and (2) the effect of the different methods on the establishment and growth of natural reproduction.

Mr. Andrews said that these are important problems in the forested areas of Minnesota, and that M. & O. is hopeful the study will find the answer.

The value of the scholarship is $900, which the company will pay to the University to be placed in a fund to be known as the Mando Graduate Scholarship Fund. Arrangements for this scholarship were concluded through the cooperation of Dr. Henry Schmitz, Dean of the College of Agriculture, Forestry and Home Economics of the University of Minnesota.

Stein Hall Promotes O'Neill

Edwin A. O'Neill, who for five years has been a member of the sales staff of the Philadelphia branch office of Stein, Hall and Company, Inc., has been appointed acting manager of the company's St. Louis branch at 4030 Chouteau Ave.

Rising Pay Scale Lifted

PITTSFIELD, Mass., February 1, 1946—Effective Monday, 200 employees of the Rising Paper Company received general pay raises.

Hourly paid workers receive an increase of five cents per hour, while those working on shifts are given a shift differential, in addition to the five-cent hike. Those on the 3-11 PM schedule get an added four cents per hour, making their total increase nine cents. An additional six cents an hour was given workers on the 11 PM-7 AM shift, making their total hike 11 cents. The company will also pay hourly workers for New Year's Day, Labor Day and Christmas, holidays they do not work.

The firm gave workers a seven cents-per-hour raise last July, which is in addition to an incentive bonus which has been paid annually. Richard H. Dempsey, general manager, has announced that piece work and bonuses also have been revised upwards, adding considerable to workers' take-home pay.

Heisley Sells Rai Wires

J. Willard Heisley and Company, Inc., 2018 Chestnut Street, Philadelphia, Pa., has been appointed selling agents in the United States and Canada for Rai wires made by the French General Electric Company, Rai Tillieres Works who are again preparing to ship their special bronze fourdrinier wires to the paper mills. Rai Tillieres specialize in triple warp, double warp, single twisted and long crimp wire which prior to the war were being used by many of the leading paper mills. Mr. Heisley has been selling Rai wires since 1922 to the paper industry in the United States and Canada and expects to renew many of his former connections.

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STANLEY CAR BANDING

Packing and shipping is speeded up and simplified – shipments arrive in good condition – troublesome damage claims are reduced when you provide the double protection of Stanley Steel Strapping and Car Banding.

Reinforced with Stanley Steel Strapping, skids and cases are fully protected for long transit, rough handling. Tare weight can be kept to a minimum.

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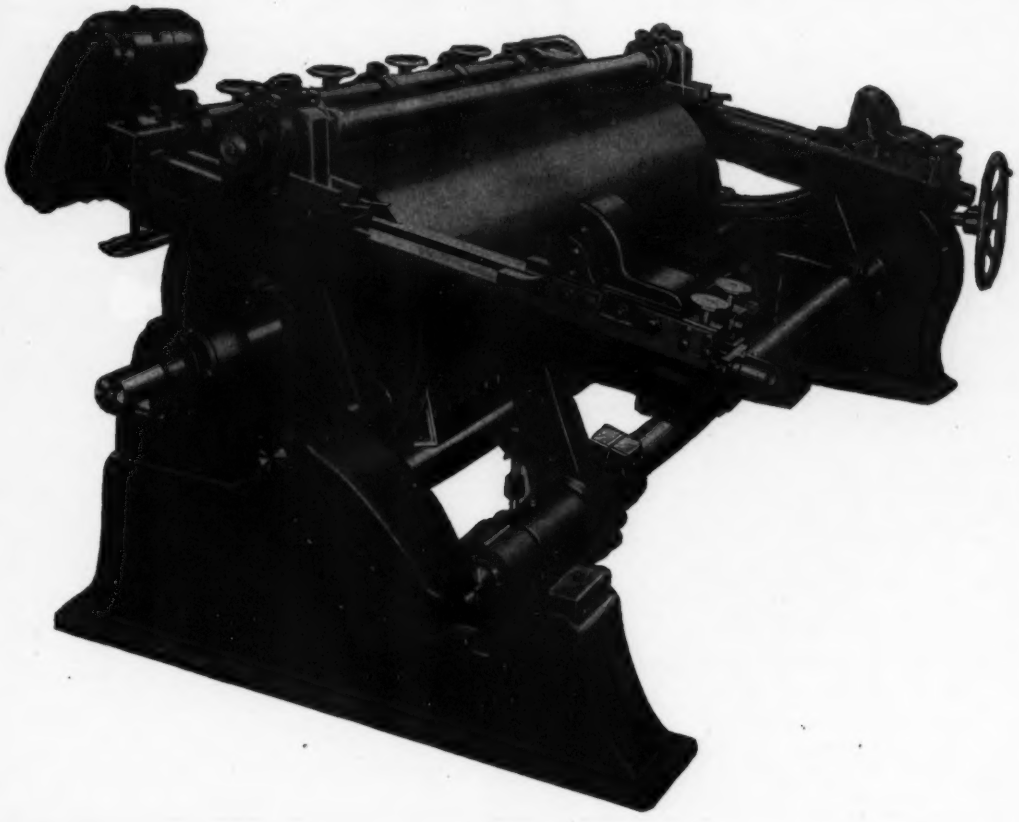


Modern Bagley & Sewall High Speed Reels

THE DESIGN of this reel is the result of careful study of the features essential to a satisfactory operating high speed reel. Among the advantages obtained from this design is ease of passing the sheet to the empty reel drum, uniformity and trueness of running of the reel drum, uniformity of tension throughout the winding action. Without exception, all operators using this reel are enthusiastic in their praise of it, maintaining that it is one of the most convenient reels they have ever handled.

BAGLEY B&S SEWALL

THE BAGLEY & SEWALL COMPANY

Builders of Paper Making Machinery

WATERTOWN, - NEW YORK

Evans Heads Wrapping Paper Group

CINCINNATI, Ohio, February 9, 1946—The Middle States Wrapping Paper Association at its annual meeting in Columbus, Ohio, on Wednesday, January 30th, 1946, elected the following officers for the coming year: President, Edward F. Evans, Cincinnati; for vice-president, Martin D. Schwartz, Muncie; for secretary-treasurer and counsel, John L. Richey, Cincinnati. Vincent J. Schlachter of Toledo, was elected to represent the association on the wrapping paper board of directors of the National Paper Trade Association.

The meeting welcomed back to their first meeting after their discharge from the service, former President Lieutenant Commander T. Floyd Smith, Lieutenant Commander Don Nesbitt, Lieutenant Martin D. Schwartz, Lieutenant William McMinn all of the United States Navy and Major Tony Miller of the United States Army.

Gaio Joins John Waldron

Arthur Gaio, recently released from the Navy after serving as captain of a mine sweeper in the Pacific, has joined the staff of John Waldron Corporation, New Brunswick, N. J. Prior to entry on active service, Mr. Gaio was engaged in plastics research with Chrysler Corporation Engineering Laboratories, and he will continue his work in the plastics field with Waldron.

Rising Installing New Beaters

HOUSATONIC, Mass., February 11, 1946—Two 1500-lb. Jones-Bertrams beaters are being installed at the Rising Paper Company. These beaters are among the first units to be made of a new all stainless steel tub construction, manufactured by E. D. Jones & Son.

Huyck Film Tells Story of Paper

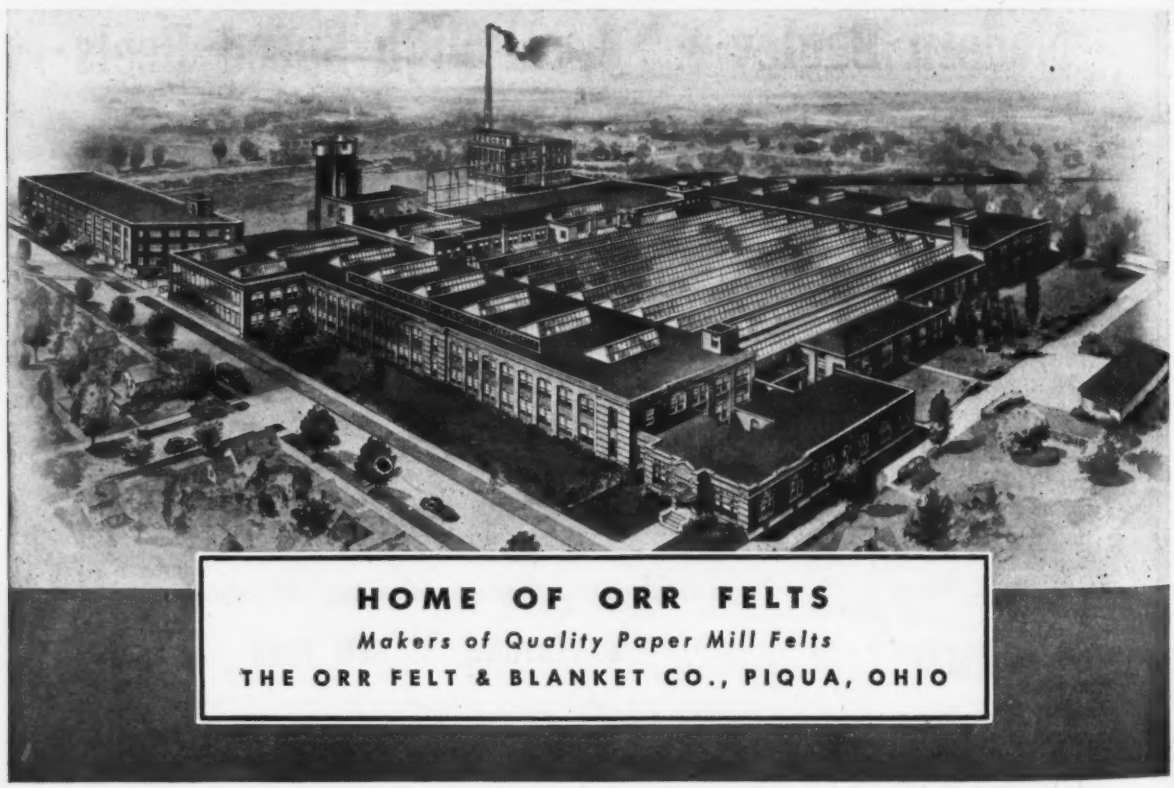
A new sound-color film, "Paper—Pacemaker of Progress" telling the dramatic story of paper and its contribution to civilization, just been completed by F. C. Huyck & Sons, Albany, N. Y., will have its first public showing during Paper Week in New York City, with the premiere taking place at the TAPPI luncheon meeting at the Hotel Commodore on February 28.

The film was planned by the Huyck firm to mark the completion of its three quarters of a century of service to the industry in designing and manufacturing papermaker's felts. The historical sequences of the film were personally supervised by Dard Hunter, curator of the Paper Museum at the Massachusetts Institute of Technology. The firm also had the cooperation of the Franklin Institute of Philadelphia, the Metropolitan Museum of New York, and many paper manufacturers. This film will soon be available for showings before paper mill and educational groups throughout the country.

Bowers to Expand Envelope Plant

INDIANAPOLIS, Ind., February 4, 1946—Purchase of three lots in the rear of 957 West Michigan street as a site for an additional building for the Bowers Envelope and Lithograph Company, has been announced by Clyde A. Bowers, president. Additional personnel will be used, he said.

The new structure, 100 by 120 feet, will be built at the rear of the company's present plant. The building will be of reinforced concrete and will have a basement. Six new envelopes, now on order, along with other new equipment, will be housed in the new building.



Portrait study OF A BEAUTIFUL LABOR STATISTIC

You could call it a portrait of eight members of the Troy Blanket Mills' 50-Year Club in New Hampshire—and these would be the facts.

Or you could call it a portrait of the enviable labor situation which employers will find in Northern New England — and that would be a highly warrantable conclusion.

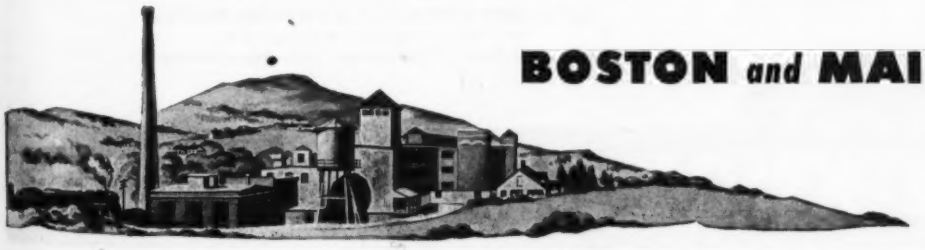
For in this typical New England company, located in the famous Monadnock vacationland, 68 per cent of the employees have worked with the mill for periods from five to sixty years, yet their average age is only forty-one!

Beautiful? We think so!

Beautiful with the warm, friendly glow of mutual confidence between employee and employer. For a skilled, intelligent, stable labor group is helpful to management in more ways than one short page can list.

If you are seeking new factory locations, consider Northern New England — where good living and working conditions are combined with excellent power, water, and transportation facilities.

The Boston and Maine Railroad is an integral part of Northern New England's economic life. We make a close, continuing study of this region's manufacturing opportunities. That's our job. We keep a file of desirable sites available for you — now. We want you to have this information. Write your requirements to: E. F. Reed, Manager, Industrial Department, Boston and Maine Railroad, Boston 14, Massachusetts.



BOSTON *and* MAINE

BOSTON and MAINE RAILROAD

"MINUTE MAN SERVICE"

Ohio TAPPI Discusses Testing Equipment

The Ohio Section of the Technical Association of the Pulp and Paper Industry met at the Manchester Hotel, Middletown, Ohio, on February 5, 1946. Carl D. Roess of the Wrenn Paper Company presided as chairman. About 60 attended.

A symposium on Paper Testing Equipment was held. Earl Prince of the Champion Paper & Fibre Company, Hamilton, Ohio talked on The Care and Calibration of Testing Instruments. In this talk he discussed the Mullen tester and listed the causes of imperfect operation and showed methods of checking the accuracy of the tester. In discussing the Elmendorf tearing tester he indicated the following guides to its proper maintenance: The bearing surfaces should be protected from wear; the pointer hub and bearing surface should be kept clean and smooth; the pointer pin should fix smoothly in its seat and in the groove; the sample jaws should be checked for alignment; the slitter knife should cut an initial slit of 2 cm; and the sample size should be checked for 6.3 cm. The Schopper folding tester was also discussed. He indicated that this machinery must be checked daily. Proper lubrication, cleaning and alignment is necessary.

C. E. Brandon of the Aetna Paper Company, Dayton, Ohio discussed Instrument Variables. Particular stress was put on variables due to relative humidity, and slippage of the test specimens in the machines.

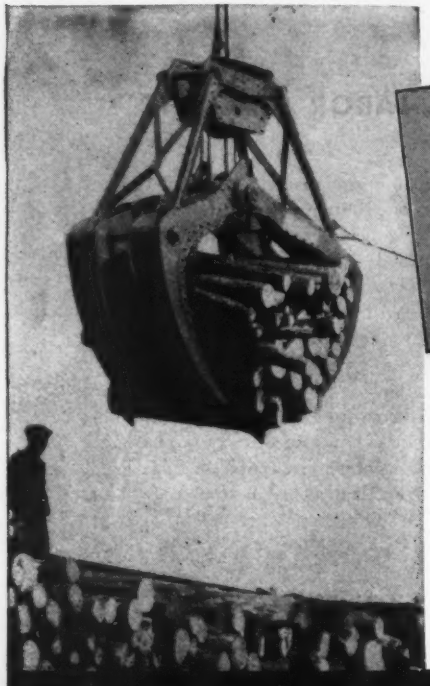
Paul Schaffrath of the Aetna Paper Company talked on Evaluation of Test Results. In this talk Mr. Schaffrath presented an outline of statistical methods and discussed the setting up of a control chart method of evaluating results, by which it is possible to first eliminate chance results out of the complete range of the tests and finally get results which will have good control.

The following attended: R. L. Betts, C. Betten, C. E. Brandon, D. S. Brown, John Burdsall, P. E. Daley, John Dow, A. C. Groom, S. Hluchan, Howard Harrison, Harold Hixon, R. W. Holman, R. J. Johnson, E. A. Johnson, C. Kittenhouse, Earl O. Knapp, Harold Koch, G. B. King, Homer Latimer, Geo. Losher, Eddie Lum, W. H. Laymon, F. D. Long, R. M. Lawson, Henry B. Lytle, R. L. McCray, P. A. Morrison, C. W. Marion, Ralph Myers, Leo Meyer, K. F. Miles, Kon Matchuk, Sam Olsen, E. W. Prince, J. H. Peters, Carl Roess, W. C. Slattery, R. H. G. Smith, J. W. Symes, Paul Schaffrath, H. J. Shults, E. J. Schroer, Grant Sharpe, J. R. Sutfin, Art Thurn, W. R. Turner, L. M. Tyler, W. H. Williams, Myron Wittner, W. E. Wiltse, E. Warner, E. A. Rinell, L. R. Gwaltney.

Pennsalt Plan Covers All Employes

PHILADELPHIA, Pa., February 11, 1946—The Pennsylvania Salt Manufacturing Company has drawn up a company-financed retirement program which will affect all employes, including hourly workers, in its plants and offices from coast to coast. Leonard T. Beale, President, said the plan, immediately effective, will provide for the retirement of all employes, from officers down, at the age of 65, unless otherwise specifically ordered by the Board of Directors.

Under the retirement benefit plan, employees will be eligible for monthly payments of one and a half percent of the highest annual pay in the three years preceding retirement, multiplied by the years of service. The maximum monthly payments will be 40 percent of the highest annual pay less an amount equal to Social Security benefits.



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Two thousand cords unloaded from lake boat hold to shore in only forty-six hours! A routine job for a No. 16 Blaw-Knox Pulpwood Grapple.

This grapple is built for fast unloading from ship or car . . . fast re-handling from stacks.

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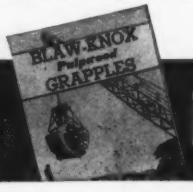
BLAW-KNOX PULPWOOD GRAPPLES



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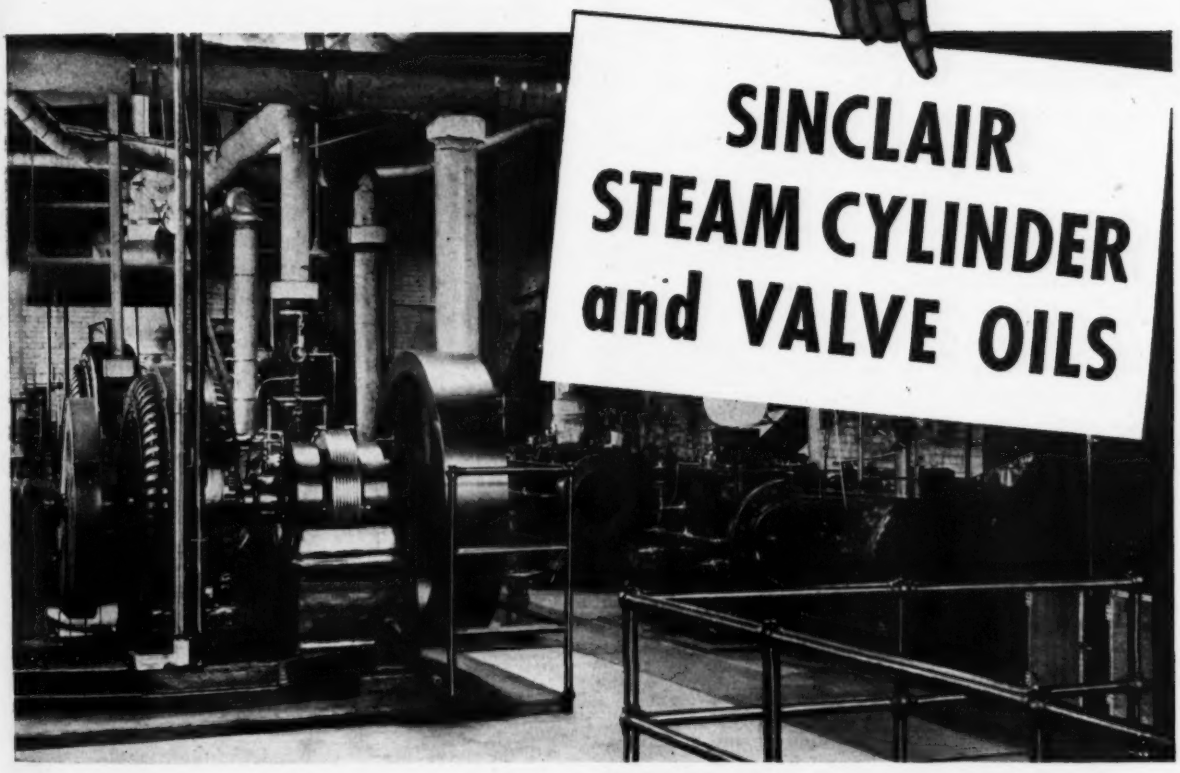
FOR DIFFICULT OPERATING COMBINATIONS



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PAPER
TRADE JOURNAL
Title Reg. U. S. Pat. Off.
W. L. Cook, Editor

SETTLING LABOR DISPUTES

Any curtailment of production through labor disputes is too costly to the disputants, and to the public; the value of time and production lost cannot be regained. At this critical period in the first year of reconversion it is unfortunate that no formula has been found to resolve differences and to prevent strikes. Collective bargaining is the most widely approved manner but this method has, in the past as at the present time, only returned workers to plants after protracted shut-downs. In pre-war strikes the principal problem was wages. Today the problem must also consider prices. With the desire to bring about a prompt and satisfactory settlement of the differences between employer and employee, President Truman has adopted the fact-finding device.

Management has voiced its chief objection to a Government fact-finding board by asserting that its members are inexperienced in manufacturing and do not know how to fairly and accurately compute costs of a product. Labor, on the other hand has stated its chief objection to a statutory authority, such as a fact-finding panel, because it includes a legal ban on strikes for a thirty-day-period while the fact-finding body is conducting its investigation of the facts. And after the "facts" are assembled it appears almost impossible for two opposing parties to agree upon what are the real facts in the case. The whole problem is highly controversial and while it would appear that a third party, such as Government, could serve as a mediator to bring the opposing forces to an agreement, the better prospect still appears to be the uncompulsory method of direct negotiation or collective bargaining between employer and employee.

But there is one aspect of the fact-finding method which has been given little attention. That is the consideration of the fact-finding plan analogous to the old processing and undistributed profit taxes. From this viewpoint it is more of a constitutional problem. It was clearly discussed by Godfrey N. Nelson, a tax authority, in a recent issue of *The New York Times*. Mr. Nelson stated that: "The appointment of fact-finding boards by the President for the purpose of ascertaining among other objectives, whether employers have the ability to pay increased wages involves old as well as new principles of enforcing compulsory payments by private enterprise. If the principle could be accorded Congressional sanction, the movement would constitute the initial step toward the adoption of a new form of taxation."

Mr. Nelson went on to say that: "We ordinarily think of taxation as a levy by the Government or its subdivisions for the support of activities of Government or its subdivisions. But taxation has not always been confined to these patterns or purposes. Taxation has been levied on one segment of industry for the benefit of another. This was the case in the so-called processing tax which was enacted in 1933 (Agricultural Adjustment Act) for the benefit of farmers whose acreage and quantity of livestock had been reduced by official order. These taxes, more or less arbitrarily imposed, were declared unconstitutional by the United States Supreme Court on January 6, 1936."

In commenting upon the examination of a concern's books by a Federal agency, the writer said: "There is considerable analogy between a statutory right of a governmental agency to examine books and, based on its findings, to divert corporate earnings or surplus, and the policy of subsidizing agriculture under a more or less political framework, which could not be justified by any economic allocation of benefits. Moreover, to exact compulsory payments from one class of industry in order to give it to another seems clearly in contravention of the Fifth Amendment of the Constitution. And if this be true, the indicated process of socializing industry would necessarily call for the scrapping of the Constitution."

In reference to the former Undistributed Profits Tax, Mr. Nelson said: "Another tax measure with which parallels may be drawn is the undistributed profits tax, effective for 1936, 1937 and 1938, when it failed of reenactment. This tax succeeded the processing levy and was also motivated by social-economic thinking. By that measure it was sought to cause corporations to divest themselves of earnings remaining after the payment of taxes under threat of a penalty. Whether or not a corporation had an accumulated deficit or surplus, it was coerced to distribute current earnings. And although it is now seven years since the undistributed profits tax was abandoned, the courts are still laden with cases presenting questions of equitable administration of the measure."

Continuing, Mr. Nelson pointed out that: "But

Calendar of Coming Events

February 25-28, 1946.—American Paper and Pulp Association, Annual Convention, Waldorf Astoria Hotel, New York.

February 25-28, 1946.—Technical Association of the Pulp and Paper Industry, Annual Convention, Commodore Hotel, New York.

February 28, 1946.—Waxed Paper Institute, Annual Meeting, Hotel Pennsylvania, New York.

April 1-3, 1946.—National Paper Trade Association, Annual Convention, Waldorf Astoria Hotel, New York.

June 17-20, 1946.—American Pulp and Paper Mill Superintendents Association, Annual Convention, Poland Spring, Me.

unlike the undistributed profits tax, the compulsory payment of increased wages would be required to be made whether or not earnings remained for the employer. . . . As in the case of the undistributed profits tax, however, the diversion of corporate earnings would have the effect of a reform measure by which the Government could dissolve the private enterprise system in favor of a socialized industrial order. . . . It is inconceivable that a Congress which repealed the excess profits tax and the declared value excess-profits tax would give statutory authority to any board or agency to arbitrarily increase wages or even to permit of its making recommendations in regard thereto based upon a supposition as to ability to pay. To do so would be practically equivalent to transferring authority to such board to manage the employer's business. Immediately this were done, small business might just as well capitulate while it is still solvent. Even if it were suggested that small business would be given individual consideration in the fixing of wages rates, this would be small consolation because any such plan would prove unworkable. There could be as many wage scales as there were employers of labor."

United Paperboard Appoints Two

Leeds Mitchell, Jr., and Norman A. Olson have been appointed sales representatives of the Folding Carton Division of the United Paperboard Company. They will cover the New England territory, with headquarters in Providence, R. I.

Both Mr. Mitchell and Mr. Olson have had experience in the printing and advertising fields prior to being commissioned in the United States Air Corps. Both were recently released from the Army Air Forces.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1945		Corresponding Weeks—1944	
Dec. 29	60.8	Dec. 30	62.0
Jan. 5,'46	89.1	Jan. 6,'45	81.0
Jan. 12	95.3	Jan. 13	88.7
Jan. 19	94.4	Jan. 20	89.0
Jan. 26	94.5	Jan. 27	88.4
Feb. 2	*101.5*	Feb. 3	88.8

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1945	86.7	89.4	90.2	88.1	89.8	91.2	80.8	88.6	90.2	95.9	95.5	91.0	89.7
1946	*94.7*												

COMPARATIVE YEARLY SUMMARIES

	1939	1940	1941	1942	1943	1944	1945	1946
Year to Date	76.7	89.1	86.1	104.3	87.2	88.6	86.2	*94.7*
Year Average	83.4	85.6	97.4	90.4	87.8	88.1	89.7	

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS †

Current Weeks—1945		Corresponding Weeks—1944	
Dec. 29	52	Dec. 30	57
Jan. 5,'46	75	Jan. 6,'45	80
Jan. 12	**94**	Jan. 13	95
Jan. 19	93	Jan. 20	94
Jan. 26	94	Jan. 27	95
Feb. 2	95	Feb. 3	92

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1945	91	95	97	97	96	96	86	90	91	97	95	85	93
1946	*90*												

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

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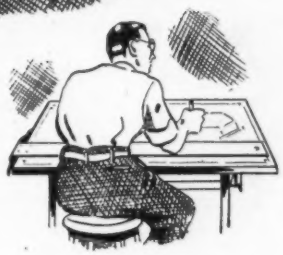

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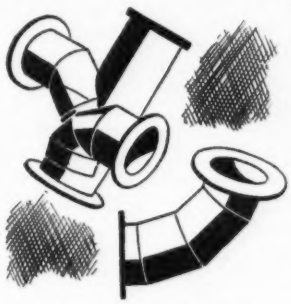

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Edited by R. G. Macdonald, Secretary

Studies of Dielectric Properties of Chemical Pulps*

II. Study of Certain Factors Influencing the Dielectric Strength of Paper.

By Daniel O. Adams[1]

Abstract

Certain impregnated electrical papers, such as high-voltage cable paper, must have high dielectric strength. Although paper is rarely called upon to withstand puncture by high voltage in its unimpregnated condition, industrial specifications require that the unimpregnated paper be tested for dielectric strength in the paper mill. In the absence of extensive published work on this aspect of electrical papers, the present work was designed to study the factors influencing the dielectric strength of unimpregnated paper and to obtain information on the mechanism by which breakdown occurs. Apparatus is described which makes it possible to measure the electrical breakdown voltage gradient in dry paper in an atmosphere of dry nitrogen at various pressures. The variables investigated were gas pressure, moisture content, temperature, sheet density, and sheet thickness. A theory of the mechanism of dielectric breakdown in unimpregnated paper is presented which accounts for the major observed phenomena. Poor correlation between the dielectric strength of paper as tested in air and the performance of the electrical equipment fabricated from this paper is observed in practice, and the difficulty may lie in that the mechanism of breakdown of paper in air is quite different from that of paper in oil.

Paper is desirable as a dielectric or electrical insulator because it has high electrical resistance, high specific inductive capacity (dielectric constant), and low power factor (dielectric loss). In addition to its electrical properties, paper is relatively cheap and readily obtainable and is supplied in sheet form having high flexibility and sufficient tensile strength to withstand stresses occurring during the fabrication of electrical equipment. For these reasons, the use of paper in the electrical industry is widespread.

In the use of a dielectric or insulator, that property known as its dielectric strength is of utmost importance. It imposes an upper limit to the voltage stresses to which the dielectric may be subjected with safety. Dielectric strength is that faculty of a dielectric which enables it to offer an extremely high resistance to the flow of electric current despite the voltage stress. If, however, the voltage stress exceeds the dielectric strength of the material, phenomena known as breakdown or failure occur and the dielectric becomes conducting. With solid dielectrics, the damage occurring at breakdown is irreparable and subsequent applications of voltage give breakdown at lower voltages than originally.

The dielectric strength of a material is determined in practice by placing a specimen between electrodes and subjecting it to a voltage stress until breakdown occurs. The dielectric strength of the material is then expressed in terms of the voltage stress or gradient at the instant of breakdown—i.e., the total voltage at breakdown divided by the thickness of the specimen. The values for the dielectric strength thus obtained depend upon the previous history of the dielectric, the conditions of the test, the time-voltage schedule, and the geometry of the test equipment.

The dielectric strength testing of paper has been carried out largely on impregnated paper samples, frequently in the form of fabricated condensers or cables. In this way, the paper can be tested directly under conditions simulating those of actual use. At the same time, changes in moisture content during the period of test are minimized and corona, together with its damaging effects, is practically eliminated. However, the dielectric properties of the impregnant are superimposed upon those of the paper in a complex fashion.

Control tests of dielectric strengths of paper for electrical uses are frequently carried out in room air without impregnation. In this case, the presence of corona and moisture content variations probably distort the results and make interpretations uncertain if not impossible.

The object of the present study was to investigate the dielectric strength of paper and certain of the variables affecting it. As a result of this investigation, it was hoped that information might be obtained concerning the mechanism by which breakdown occurs. The paper specimens were not oil impregnated but were tested in an atmosphere of dry compressed nitrogen. By varying the pressure, the dielectric strength of the impregnating gas could be made to vary continuously without appreciably affecting the other electrical characteristics of the fiber-gas combination.

* To be presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Hotel Commodore, New York, N. Y., Feb. 25-28, 1946.

A portion of a dissertation submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wis., 1943. This work was carried out under the direction of J. A. Van den Akker. Part I, by Delevanti and Hansen, appeared in *Paper Trade J.* 121, No. 26: 35-43 (Dec. 27, 1945).

[1] Member TAPPI; Present address, Experimental Plant, West Virginia Pulp and Paper Co., Covington, Va.

Historical Survey

Most of the research work on the dielectric strength of paper has been carried out by the manufacturers of electrical equipment involving paper as a dielectric. The paper manufacturers who supply the electrical industry with its paper have published practically nothing. The information appearing in the literature on this subject is very fragmentary, and many of the gaps must be filled by analogy with the behavior of other dielectric materials.

A good review of the literature up to 1932 on the dielectric strength of dielectrics in general is found in the book of S. Whitehead *(1)*. This publication contains a good discussion of the phenomenology and a review of the theories of dielectric breakdown which had been set forth up to that time. Briefer reviews of the general subject are given in the books of Peek *(2)* and Miner *(3)*. J. B. Whitehead devotes a chapter of his monograph on impregnated papers *(4)* to the dielectric strength of such papers.

No doubt the most important variable in dielectric strength measurement is the duration of the voltage stress. Voltages below the value causing instantaneous breakdown may result in eventual breakdown if applied for sufficiently long periods of time. There are many empirical formulas for expressing this time-voltage relationship. Best known of these is "Peek's Law" *(2)* which states that the time to breakdown is proportional to the reciprocal of the fourth power of the difference between the applied voltage and some reference voltage. Other formulas express the time as inversely proportional to some power of the applied voltage, the power chosen ranging from two to seventeen.

Voltage waveform *(1, 3, 6)*, frequency *(3, 7, 8)*, gaseous ionization *(9)*, the electrolyte content of the specimen *(10, 12)*, its porosity *(13)*, and the presence of any pinholes *(12, 14)* are reported to affect the dielectric strength.

The effects of temperature on the dielectric strength of paper are often masked by variations in the moisture content of the specimens which result from the temperature variations *(3, 15)*. Most theories of breakdown, especially the so-called "thermal" theories, demand that temperature increase have an unfavorable effect on the dielectric strength.

In general, the dielectric strength of cellulose decreases with increased moisture content. Kohman *(12)* stated that moisture contents below 0.1% have no effect on the electrical properties of the insulation.

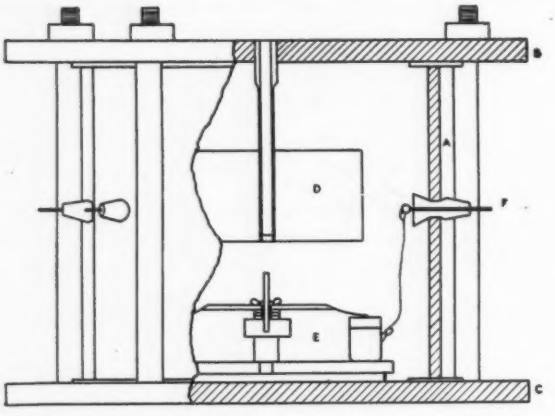

FIG. 1

Test Chamber. Side View Half Section. A. Chamber Wall; B. Top Plate; C. Bottom Plate; D. Thermometer Well; E. Electrodes; F. High Voltage Lead-in

J. B. Whitehead *(16, 18)* found that the dielectric strength of impregnated paper insulation decreased as the density increased. He explained this as the result of the increased specific inductive capacitance of the denser sheets, which increase would result in an intensification of the field in the oil channels between the sheets and, hence, breakdown at a lower over-all voltage would occur. Later he included a factor which depended upon the ions desorbed from the paper into the oil, thus increasing the conductivity of the oil. Because the higher density sheets contained a higher ratio of fiber to oil, the number of ions thus desorbed would increase with sheet density. Under the applied voltage these ions were said to migrate to the edges of the oil channels where they acted as space charges and increased the stress in the oil-paper interface.

The dielectric strength of paper has been observed to decrease with increasing thickness of the paper sheet. Clark and Montsinger *(5)* found that the breakdown voltage stress varied as the reciprocal of some fractional power of the specimen thickness, where the fraction lay between zero and one-half. J. B. Whitehead also found the dielectric strength of impregnated paper to decrease with increasing thickness. He explained this by the same mechanism as is used to explain the effect of density—namely, the thicker sheet involved a greater ratio of fiber to oil and, hence, a greater concentration of ions which form space charges within the oil channels.

Apparatus

The literature makes no mention of an apparatus for determining the breakdown gradient of dry paper in an atmosphere of compressed nitrogen; therefore, such an apparatus had to be devised. This apparatus consisted of the following components: a source of high voltage, a high voltage voltmeter, an electrode system, a test chamber, a system for evacuating the test chamber and for supplying it with gas under pressure, and a detector to indicate breakdown.

The source of high voltage consisted of a General Electric luminous-tube type transformer which was rated at 900 volt-amperes, at a secondary voltage of 15,000 volts. The primary was designed to operate on a 110-volt, 60-cycle line. In order to make the high voltage supply continuously variable, the primary of the high voltage transformer was connected across the secondary of a General Radio Variac (an auto transformer) having a maximum output of 130 volts. To make possible a finer adjustment of the voltage, a variable resistor was inserted in series with the primary of the high voltage transformer. The high-voltage voltmeter consisted of a high resistance (15 megohms) and a calibrated combination of microammeter and full-wave instrument rectifier.

The test chamber (Fig. 1) consisted of a 7-inch length of 8-inch seamless steel tubing having a ¼-inch wall. The top and bottom of the chamber were formed by two 12-inch squares of ½-inch boiler plate. The chamber was held together by five ½-inch round iron rods which were screwed into the bottom plate and protruded through holes in the top plate. The adjustment of nuts on the protruding ends of these rods made possible any desired compression of the gaskets which sealed the joints between the tube and the two plates.

In the wall of the test chamber, ten equally spaced holes were drilled. Into each of these holes a No. 0 rubber stopper was forced from the inside of the chamber. The portion of the stopper which pro-

truded outside the chamber expanded sufficiently to prevent the stopper from being sucked back into the chamber during evacuation. Each stopper was pierced centrally with a length of No. 18 copper wire prior to its insertion in the wall of the chamber. The wire served as a high voltage lead-in and the rubber stopper served as insulation.

Vacuum and pressure connections to the test chamber were made through a ¼-inch pipe screwed into the chamber wall.

A thermometer well consisted of a nipple of ⅛-inch pipe screwed into the center of the top plate. All but a short portion of the threaded end of the nipple was turned down to a wall thickness of 0.02 inch to reduce the transfer of heat by conduction between the top plate and the bottom of the thermometer well. A snug-fitting brass button was soldered in the lower end of the well. Ten radial copper fins, blackened with a thin coat of black lacquer, were soldered to the lower portion of the well to aid heat transfer between the well and the surrounding gas. The difference between the temperature in the well and that of the gas surrounding the well was found to be less than 2°C. under ordinary working conditions.

The electrode system (Fig. 2) consisted of ten small high-voltage electrodes and one large common ground electrode. The ground electrode formed the base of the system. The high-voltage electrodes were placed in a circle upon the ground electrode and were separated from it by the paper specimens. A clamping device held the high-voltage electrodes against the paper samples with a definite force.

The ground electrode was made of a 5¾-inch disk of ¼-inch brass. It was ground smooth and flat and polished. This electrode was mounted on three legs made from phonograph needles set in holes in the bottom of the electrode. These legs enabled the plate to be thermally insulated from the bottom plate of the test chamber (hence at a temperature more nearly that of the gas), and yet to be electrically connected to it by the sharp points of the needles. A short stud in the center of the electrode supported the spring clamping mechanism.

The high-voltage electrodes were made from ¾-inch lengths of ¾-inch round brass rod. The edge of the lower end of each electrode was turned to a ⅛-inch radius, and the face was ground smooth and flat and polished. Small loops of wire were soldered to the sides of the electrodes to afford electrical connection. These electrodes were connected to the high voltage lead-ins by short links of stranded wire with "Peewee" clips at one end. A ¾-inch square of thick plate glass was cemented to the top of each electrode to insulate it from the clamping device.

The clamping device consisted of a 3-inch disk of brass having a central hole that loosely fitted over the stud which protruded from the ground electrode. The edge of the disk had a 30-degree bevel and on this beveled portion were fastened ten 1-inch leaf springs. These springs were arranged to contact the glass plates on top of the high-voltage electrodes. By the proper positioning of the disk, it was possible to deflect the springs sufficiently to obtain a pressure of 7.5 p.s.i. on the face of each electrode.

The system for varying the pressure within the test chamber and also to evacuate it is best understood by reference to Fig. 3. The pressure was supplied from a cylinder of compressed nitrogen. The nitrogen was dried by passing through a drying train which consisted of a 16-inch length of 1-inch pipe, of which the first 6 inches were filled with Anhydrone and the last

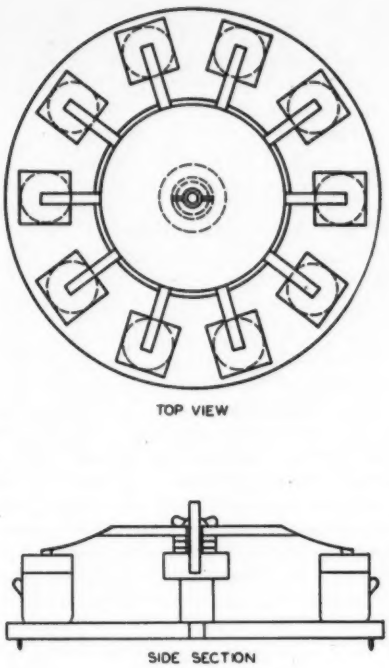

FIG. 2
Electrode System

10 inches were filled with phosphorus pentoxide. At every 2 inches throughout the length of the tube plugs of glass wool were inserted to minimize channeling. The drying train and the pipe fittings connecting it to the test chamber were sealed together with de Khotinsky cement to preclude the entrance of moisture. The globe valves were fitted with soft rubber disks and packed with cotton waste saturated with stopcock grease. Evacuation was obtained with a Cenco Hyvac pump. The system was sufficiently tight to permit evacuation to less than 10 microns pressure with paper specimens in the test chamber. Pressures in the test chamber during the evacuation were measured by a McLeod gage.

The test chamber was heated by three Mazda spotlight projector lamps.

Breakdown of the paper specimens was detected by amplifying the voltage variations across a 600-ohm resistor in the ground return line from the test chamber. Breakdown was evidenced by a loud popping or frying noise in the headphones.

Test Procedures and the Preparation of Paper Samples

Preparation of Paper Samples

The pulp used in the formation of the paper sheets for dielectric strength testing was prepared by cooking spruce chips in an indirectly heated 10-pound experimental digester by the kraft process to a TAPPI permanganate number of 17.0.

The pulp was beaten or refined prior to sheet formation in a Lampén ball mill to a Schopper-Riegler freeness of approximately 700 ml. The high degree of reproducibility of results with the Lampén ball mill, the small size of the pulp charge required, the simplicity and speed of operation, and the probable lack of contamination of the pulp through the introduction of inorganic matter during beating prompted the use of this piece of equipment.

Handsheets from the beaten pulp were formed on

the British sheet mold. These were allowed to dry in room air and, when dry, a 4-inch square was cut from each handsheet. This square was in turn cut into 1-inch squares. By this method only the central portions of the handsheets were used. The 1-inch squares were carefully inspected both with reflected and with transmitted light, and those containing irregularities or dirt were discarded. The accepted specimens were stored in a desiccator over calcium chloride. Care was taken during the above operations to limit contact between the specimens and the hands to a practical minimum. Once in the form of the 1-inch squares, the specimens were handled only with tweezers.

Desiccation of the Samples

In most cases the samples were tested for breakdown gradient only after a period of desiccation, during which the sample was inside the test chamber and in position to be tested. The drying was accomplished by prolonged evacuation of the test chamber while it was at a temperature of 60° to 70°C. Because of the difficulties encountered in removing the specimens from the test chamber without absorption of moisture from the outside air, no direct tests were made of the efficiency of this method of desiccation. The method was tested indirectly, however, by desiccating samples for various lengths of time and then testing them for breakdown gradient. It was shown that evacuation for periods longer than 12 to 15 hours increased the breakdown gradient of the samples but little. Evacuation for periods shorter than 12 hours revealed a steady improvement of the breakdown gradient with increase in the evacuation period. For the purpose of this work, it was decided to standardize on a desiccation period of 14 hours. This period was within the range of essentially constant breakdown gradient and was convenient in that the samples could be desiccated overnight.

Testing Samples for Dielectric Strength

The specimens to be tested were removed from the desiccator in which they had been stored, and the thickness of each square was measured with a micrometer caliper in accordance with TAPPI Standard T 411 m. The specimens were placed in the electrode system and this, in turn, was placed in the test chamber. Each high-voltage electrode was then connected with the appropriate high voltage lead-in. The test chamber was closed, the vacuum pump started, and the heat lamps turned on. The preceding operations were carried out as rapidly as was consistent with accuracy, in order to minimize the absorption of moisture from the atmosphere by the paper specimens.

After the period of desiccation was complete, the valve leading to the vacuum system was closed and the vacuum relieved with dry nitrogen. The pressure of the nitrogen within the test chamber was slowly brought to the desired magnitude by a number of small pressure steps. The pressure in the test chamber was measured with a calibrated pressure gage. The temperature of the test chamber was adjusted to the value desired for testing.

The electrical ground connection was attached to the test chamber; the high-voltage lead was connected to the desired high-voltage lead-in, the breakdown detector was turned on, and the electrical connections were made to the high-voltage supply.

The high voltage was applied and increased according to a definite time schedule until breakdown occurred. The time-voltage schedule was chosen in light of the caliper measurement made prior to placing

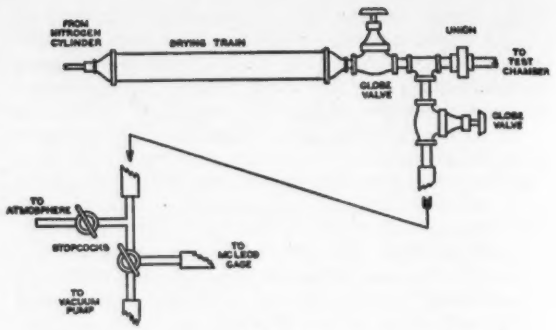

Fig. 3
Schematic Diagram. Vacuum and Gas Pressure Systems

the specimen in the test chamber (caliper foot and the electrodes having equal areas and exerting equal pressure on the paper specimens). This process was repeated for each specimen in the test chamber. In this work the rate of voltage increase was 3 volts per mil per minute until breakdown occurred. The initial voltage was so chosen that breakdown would occur in 15 to 20 minutes.

The choice of the rate of voltage increase was entirely arbitrary. It was desirable to have the rate of voltage increase relatively low in order that changes, chemical or physical, occurring within the increase in voltage stress would have time to approach equilibrium. The rate of 3 volts per mil per minute was felt to satisfy this condition and was convenient from an experimental standpoint.

Since the increase in time required for breakdown to occur at a given voltage varies inversely as the fourth power of the voltage, the effects of voltages which are more than 50 volts per mil less than the value required for immediate breakdown are very slight. This was borne out in experiment. Tests were made with the initial voltage so chosen that the breakdown occurred within 15 minutes (the voltage being increased at the rate of 3 volts per mil per minute). The results of tests on similar samples made with the starting voltage so chosen that breakdown occurred within 45 minutes were the same within experimental error.

When breakdown occurred, a voltage surge or transient was set up in the electrical system. This transient was amplified by the breakdown detector and was heard in the headphones as a loud popping or frying sound. The time of the occurrence of the first transient was considered to correspond to breakdown. Since it rarely happened that the voltage was read at the instant breakdown occurred, it was decided to calculate the breakdown voltage from the time-voltage schedule, using the time to the first transient. Since the time-voltage schedule was followed very closely, the errors introduced by calculating breakdown voltage in this manner were small.

After the specimens had been tested for breakdown gradient, their density was determined. The test chamber was opened and the electrode system was removed. The density of each specimen tested was then determined through dimensional measurements and moisture-free weight (105°C.). By this method the errors arising from sheet variations were avoided, since the density measurements were made on the specimens tested. Also, by taking the moisture-free density as a criterion, differences in the hygroscopicity of the sheets could not introduce error.

Experimental

In this work a study was made of the following variables: gas pressure, moisture content, temperature, sheet density, and sheet thickness.

In the study of the effect of gas pressure on the breakdown gradient, the specimens to be tested were desiccated 14 hours as 60° to 70°C. and the pressure within the test chamber was then raised to the desired value. The specimens were tested in accordance with the procedure outlined previously. For typical data see Table I. These data are plotted in Fig. 6. Increase in pressure is seen to cause a marked increase in the breakdown gradient.

TABLE I.—THE EFFECT OF GAS PRESSURE ON THE BREAKDOWN GRADIENT OF PAPER TESTED IN DRY NITROGEN AT 60° C.

Gas Pressure, lb./sq. in. gage	Sheet Caliper, mils	Sheet Density, g./cm.³	Breakdown Gradient, volts/mil	Number of Specimens Tested	Standard Error of Mean, volts/mil
0	3.0	0.707	170	4	3.3
50	3.1	0.720	347	4	9.7
100	3.0	0.724	469	7	3.4
148	3.1	0.731	537	3	12.7
187	3.1	0.713	598	4	9.1

In the preliminary work involved in the standardization of the desiccation procedure, it was discovered that the breakdown gradient of desiccated specimens was higher than that of undesiccated specimens. In light of this finding, it was decided to investigate the effect of greater moisture contents. Since most mill humidity rooms are maintained at 50 to 65% relative humidity and since much of the control testing of electrical papers is carried out in these rooms, it was decided to condition the sample at a humidity within this range.

This was accomplished by placing a saturated solution of calcium nitrate (which will maintain a relative humidity of 50 to 55% at 20°C.) in the test chamber along with the electrode system containing the sample. The test chamber was then sealed and allowed to stand at 20°C. for at least 6 hours to permit equilibrium to be established. At the end of the conditioning period, dry nitrogen was admitted until the desired pressure was reached, after which, 15 minutes were allowed to elapse prior to testing in order that any inequalities due to layering or incomplete mixing of the gas might be dissipated. The specimens were then tested and the results were compared with those obtained on similar specimens which had been desiccated. The results are listed in Table II. Increase in relative humidity is seen to cause a decrease in the breakdown gradient.

TABLE II.—THE EFFECT OF HIGH RELATIVE HUMIDITY ON THE BREAKDOWN GRADIENT OF PAPER TESTED IN DRY AND HUMIDIFIED NITROGEN AT 20° C.

Approx. Relative Humidity, %	Gas Pressure, lb./sq. in. gage	Sheet Thickness, mils	Sheet Density, g./cm.³	Breakdown Gradient, volts/mil	Number of Specimens Tested	Standard Error of Mean, volts/mil
50	0	2.9	0.735	178	3	11.5
0	0	3.0	0.744	195	4	3.0
50	50	3.1	0.727	309	3	5.0
0	50	3.0	0.725	361	4	1.3
50	100	3.0	0.753	441	3	8.2
0	100	3.1	0.731	492	4	5.0
50	148	3.0	0.740	524	3	16.7
0	148	3.1	0.732	596	4	3.1
50	182	3.0	0.744	583	3	14.4
0	188	3.0	0.721	679	4	9.0

The effect of temperature at the time of testing on the breakdown gradient was studied by desiccating all samples according to the standard procedure, bringing the nitrogen pressure up to the desired magnitude, and adjusting the temperature. The specimens were then tested. During the testing the temperature was maintained constant to within 0.5°C., except in the measurements made at 75.5°C., during which the temperature was maintained contant to within 1.5°C. The results of the work are shown in Table III. Increase in temperature is seen to cause a decrease in the breakdown gradient.

TABLE III.—THE EFFECT OF TEMPERATURE ON THE BREAKDOWN GRADIENT OF PAPER TESTED IN DRY NITROGEN AT VARIOUS PRESSURES

Temperature, ° C.	Gas Pressure, lb./sq. in. gage	Sheet Caliper, mils	Sheet Density, g./cm.³	Breakdown Gradient, volts/mil	Number of Specimens Tested	Standard Error of Mean, volts/mil
20	0	3.0	0.744	195	4	3.0
60	0	3.0	0.707	170	4	3.3
20	50	3.0	0.725	361	4	1.3
60	50	3.1	0.720	347	4	9.7
20	100	3.1	0.731	492	4	5.0
40.5	100	3.1	....	455	9	3.6
60	100	3.0	0.724	469	7	3.4
75.5	100	3.1	....	410	7	1.8
20	148	3.1	0.732	596	4	3.1
60	148	3.1	0.731	537	3	12.7
20	188	3.0	0.721	679	4	9.6
60	187	3.1	0.713	598	4	9.1

A study was made of the effect of sheet density on the breakdown gradient. Sheets were prepared having the same caliper but different densities. The difference in density was attained by various degrees of wet pressing of the handsheets. The range of densities covered was 0.550 to 0.820 gram per cm.³ These sheets were desiccated and tested according to the usual procedure. The results are given in Table IV. The breakdown gradient is seen to increase with decrease in density.

TABLE IV.—THE EFFECT OF SHEET DENSITY ON THE BREAKDOWN GRADIENT OF PAPER TESTED IN DRY NITROGEN AT 60° C. AT VARIOUS PRESSURES

Sheet Density, g./cm.³	Gas Pressure, lb./sq. in. gage	Sheet Caliper, mils	Breakdown Gradient, volts/mil	Number of Specimens Tested	Standard Error of Mean, volts/mil
0.555	0	2.9	161	4	10.6
0.783	0	2.9	149	4	3.3
0.569	50	2.9	357	4	8.5
0.695	50	2.9	314	4	5.3
0.730	50	2.8	311	4	9.8
0.748	50	2.7	304	4	5.0
0.809	50	2.8	294	4	5.6
0.580	100	2.8	467	3	3.5
0.826	100	2.8	423	4	2.5
0.583	148	2.8	573	4	6.8
0.715	148	2.8	524	3	6.4
0.748	148	2.7	539	4	9.8
0.755	148	2.7	523	4	9.3
0.815	148	2.8	526	4	9.8
0.586	185	2.8	683	4	6.3
0.795	185	2.9	591	4	4.4

Sheets were prepared having approximately the same density but with different thicknesses or caliper. Unfortunately, the thinner specimens were quite appreciably less dense than the thicker sheets. The samples were desiccated and tested in the usual manner. The results are shown in Table V. The breakdown gradient appears to decrease with an increase in sheet thickness.

TABLE V.—THE EFFECT OF SHEET THICKNESS ON THE BREAKDOWN GRADIENT TESTED IN DRY NITROGEN AT 60° C.

Sheet Caliper, mils	Gas Pressure, lb./sq. in. gage	Sheet Density, g./cm.³	Breakdown Gradient, volts/mil	Number of Specimens Tested	Standard Error of Mean, volts/mil
2.1	0	0.730	202	3	7.0
3.0	0	0.707	170	4	3.3
4.1	0	0.777	161	4	2.7
3.1	50	0.720	347	4	9.7
4.1	50	0.792	316	4	4.5
5.5	50	0.810	286	4	3.1
2.1	100	0.706	506	9	6.2
3.0	100	0.724	469	7	3.4
4.1	100	0.770	421	10	2.3
5.6	100	0.796	404	9	0.9
3.1	148	0.731	537	3	12.7
4.1	148	0.793	522	4	5.1
5.5	148	0.810	487	4	3.9
2.2	182	0.718	624	2	13.9
5.4	182	0.822	538	3	3.5
4.1	185	0.779	591	4	2.0
3.1	187	0.713	598	4	9.1

Discussion of Results

An examination of the data presented in the preceding section shows that each of the variables stud-

ied had an appreciable effect on the breakdown gradient of paper. The breakdown gradient decreases with increases in the relative humidity, the temperature, the sheet thickness, and the sheet density. On the other hand the breakdown gradient increases with increases in the pressure of the surrounding gas. The effect of gas pressure is very large as compared with the effects of the other variables. It amounted to a change in dielectric strength of three to four fold when the pressure was changed from 0 to 200 p.s.i. gage. The effects of the other variables never amounted to more than 10 to 15% within the ranges studied. This is truly remarkable in the case of the variation of relative humidity, which has been shown to cause other electrical properties of paper, such as the dielectric loss and resistance, to change through several orders of magnitude.

In attempting to explain the behavior of paper it must be remembered that a paper sheet is composed of two phases: a solid phase consisting of the fibrous portion of the sheet, and a gaseous phase consisting of the nitrogen which fills the interstices of the sheet and even permeates the structure of the fibers themselves. Undoubtedly, the dielectric properties of both phases are involved in the dielectric strength of the mixture.

The strong dependence of the breakdown gradient on the pressure of the gas phase would indicate that the dielectric strength of the gas is involved, since this is the only property of either dielectric which varies strongly with pressure. In general, the dielectric strength of a gas varies directly with pressure for pressures of one atmosphere or over. The literature *(2, 3)* reports that the breakdown voltage of nitrogen at atmospheric pressure is 64.5 volts/mil expressed as effective voltage (used throughout this work).

If the dielectric strength of nitrogen is plotted against pressure (curve A, Fig. 4), a straight line results having a slope of 4.4 volts per mil per pound per square inch. The average slope of the curve for the observed breakdown gradient of paper plotted against gas pressure (curve B, Fig. 4) is about 2.3.

The parallelism between the two curves (A and B) is not good but they both have positive slopes and are more or less linear. The values for the dielectric strength of nitrogen used for the plotting of the curve were obtained from tests made on pure nitrogen in a uniform electric field. In the present case the nitrogen was not stressed by itself but rather in the presence of the fibrous material of the sheet. Electrical theory shows that when voltage is applied to a mixed dielectric, an intensification of field occurs within the component having the lower specific inductive capacity. In the present case, the gas would be more intensely stressed and, hence, breakdown would occur at lower voltages. Also to be considered is the fact that the field within the dielectric is not uniform. The gas has a specific inductive capacity of unity, whereas the fibrous material has a specific inductive capacity of approximately six. The fibers are distributed throughout the space between the electrodes and at each gas-fiber interface refraction of the electric field occurs. The lines of electric flux tend to converge upon approaching a fiber and to diverge upon leaving one. The presence of two phases complicates the process of breakdown more or less mechanically. Breakdown initiating at a point in one dielectric medium cannot proceed far without being interrupted by the presence of the other medium.

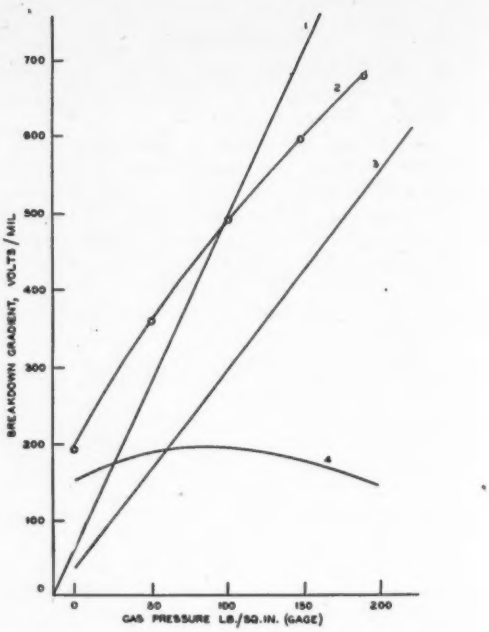

FIG. 4

The Pressure-Breakdown Gradient Relationship of Nitrogen Gas, of Paper, of Nitrogen in the Field Intensified by the Paper, and of the "Barrier Action." 1. Breakdown gradient of nitrogen; 2. Breakdown gradient of paper; 3. Calculated breakdown gradient of gas in intensified field; 4. Difference between 2 and 3 or the "barrier action"

This hindrance to breakdown would cause higher voltages to be required before failure.

In order to evaluate more or less quantitatively the effects of field intensification within the gas due to the presence of the fiber, one may consider a condenser with the space between the electrodes filled with slabs of different dielectric materials. The specific inductive capacities of the two layers may be represented by K_1 and K_2 and the voltages across the layers by V_1 and V_2. The total electrode separation may be designated by t. If the total voltage across the combination is V,

$$V = V_1 + V_2$$

By electrical theory it can be shown that

$$V = [4\pi\sigma\ (t-d)]/K_1 + (4\pi\sigma\ d)/K_2$$

where

σ is the density of the charge on the electrodes, and
d is the thickness of the layer whose specific inductive capacity is K_2.

The field (F_1) in one of the dielectrics is equal to

$$F_1 = 4\pi\sigma/K_1.$$

Substituting in the previous equation,

$$V = F_1\ [t-d + (K_1\ d)/K_2].$$

If it is assumed that breakdown initiates in medium 1 and that, once breakrown is initiated, failure of the condenser is complete, and if it is further assumed that medium 1 is a gas, then breakdown will occur when F_1 exceeds some critical value F_1' or when

$$V = V_0 = F_1'[t-d + (d)/K_2]$$

From this equation, it is obvious that breakdown will occur at lower voltages than if only one dielectric filled the entire space between the electrodes.

A sheet of paper consists of two dielectrics in series, fiber and gas. If this picture is simplified by concentrating the fibrous dielectric into one continuous layer and the gas into another continuous layer, the situation is that described above.

The thickness of such equivalent layers of dielectric can be calculated from the density of the paper sheet. The fibrous material has a density of approximately 1.5 grams per cc. The ratio of the actual sheet density to this figure will then give the fraction of the total plate separation occupied by the fiber. The thickness of the gas films between the sheet proper and the electrodes are automatically included in this method since they were measured in the volume used in computing the sheet density.

The breakdown gradient of a sheet of paper may be calculated by use of the above formula, assuming this gradient to depend solely on the gas but taking into account the effect of field intensification discussed above. K_1 may be assigned the value 1.0 (this is accurate for nitrogen even at the higher pressures), and K_2 may be assigned the value 6.0 [this agrees with the results obtained for cellulose by De Luca, Campbell, and Maass *(19)*]. The average density of the paper samples used in the tests plotted in Fig. 4 was 0.730 gram per cc. If this value is used in the formula, a value of 1 mil used for t, so that Vc will be given directly in volts per mil, and F_1' for nitrogen is expressed in terms of the gas pressure as previously mentioned, the critical voltage gradient becomes

$$V_c = 38.2\ p,$$

where p is the gas pressure in atmospheres. This expression is plotted as curve C in Fig. 4.

Inspection of Fig. 4 reveals that the curve for the calculated values of the breakdown gradient for the gas in the electric field intensified by the presence of the fiber (curve C) more or less parallels the experimentally obtained curve for the breakdown gradient of the paper specimens (curve B). On the basis of the assumptions and the theory presented thus far, the major portion of the dielectric strength-pressure dependence can be accounted for by considering the dielectric strength of the gas phase alone in a field intensified by the presence of fiber.

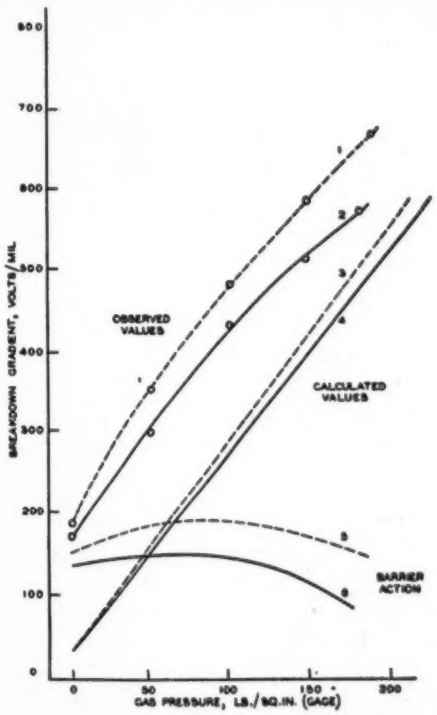

FIG. 5

The Effect of Relative Humidity on the Observed Breakdown Gradient, the Calculated Values for Gas, and the Barrier Action at 20° C. Curves 1, 3, and 5 are at 0% relative humidity; Curves 2, 4, and 6 are at 50% relative humidity.

If now curve C in Fig. 4 is subtracted from curve B and the difference plotted, the resulting curve (curve D) is no longer strongly dependent on pressure. Rather, it is a flat curve which is concave downward. This portion of the total dielectric strength should be ascribed to the "barrier action" of the fibrous material. The curvature of this plot may indicate variation of this quantity with pressure. This need not be the case, however, since higher voltages are involved in breakdown at the higher pressures and the variation might be due to these.

In order to investigate the nature of this "barrier action," it will be necessary to picture what takes place within the sheet of paper as the voltage stress increases.

The paper sheet consists of fibers with their long axes more or less parallel with the plane of the sheet but otherwise randomly oriented. The voids between these fibers are filled with nitrogen. The fibers range from 20 to 35 microns in diameter but, as a result of the beating process, considerable amounts of fibrous debris of lesser diameter is also present. The gas voids are of the same order of magnitude as the fibers but greater variations of size are to be expected.

Both the fibrous material and the gas are very good electrical insulators at low voltage stresses. In the gas phase, ions or electrons resulting from radioactive materials (which are ever present), cosmic rays, photons, etc., are accelerated in the electric field toward the electrode of opposite sign. Such currents are very small. As the voltage approaches that described by the calculated curve (curve C) in Fig. 4, the current flowing in the gas becomes much more appreciable. The electrons migrating in the electric field are accelerated sufficiently between collisions with the molecules of the gas present to cause ionization by impact with the production of secondary electrons and further ionization. The positive ions thus formed migrate in the reverse direction toward the electrode which, at that instant, is acting as cathode. In the fields involved in the present study, it is doubtful if the positive ions are accelerated sufficiently to cause ionization by impact with gas molecules; however, in the higher voltage regions they probably do cause secondary ionization by impact with the electrodes *(20)*.

These charged particles which are accelerated by the electric field will impinge on the paper fibers present and will accumulate on the fiber surfaces. Electrons will collect on those surfaces which "look" toward the cathode, whereas positive ions will collect on those surfaces which "look" toward the anode. Because the fiber has an extremely high resistance, these charges will not neutralize each other. Since these charges are separated by only the thickness of a fiber, their effect on the electric field at any great distance from the fiber will be negligible. At distances not greater than a few fiber diameters (the width of most gas voids), the effects of these charges will be quite significant. These charges collecting on the surfaces of the fibers will reduce the field within the gas produced by the electrode system. In this way, as soon as ionization commences surface charges will build up sufficiently to suppress further ionization.

Despite the fact that alternating current was used entirely during this study, the over-all picture remains unchanged. Each half-cycle the signs of the surface

charges on opposite sides of the gas voids reverse. Those charges which are dissipated by conduction and recombination are replenished by ionization during the peak portion of the cycle. Because of the high mobilities of the charged particles and the short distances involved, equilibrium conditions are probably maintained throughout the cycle.

While the surface charges building up on the fibers and the surrounding atmosphere are reducing the field in the gaseous phase, they are intensifying the field within the fibrous portions of the sheet. As the voltage increases, the magnitude of the space charges also increases until, finally, the field within the fiber exceeds its dielectric strength and breakdown occurs. Once the fiber breaks down, the space charge on and around the fiber disappears, thus permitting breakdown in the gas to proceed.

The barrier action of the fibrous material thus consists of the ability of the fibers to retain surface charges which oppose the field within the gas and effectively prevent breakdown of the gas. This barrier action persists until the field within the fibers exceeds their dielectric strength, at which point the insulating ability of the paper sheet collapses and breakdown occurs. Inequalities in the original field caused by refraction of lines of electric flux will probably cause at least local ionization to occur at voltages lower than those predicted by the calculated curve in Fig. 4. This will mean slightly greater surface charges and, hence, earlier collapse of the fiber barrier.

The total field within the fibers will consist of the sum of the field produced by the electrode system and that from the space charges accumulating at the fiber surfaces. When this total field exceeds a certain value, breakdown occurs. Since, as the gas pressure is increased, the voltage required to cause ionization is also increased, the relative portion of the critical field supplied by the electrode system becomes greater with increasing pressure. Under these conditions, the contribution by the surface charge field will be less when breakdown occurs and, thus, the barrier action should decrease with increase in pressure. If sufficiently high pressures are attained, this barrier action should disappear completely. Such pressures were never attained in this study but decrease in barrier action with increase in pressure is readily observed in the plot of the difference between the observed and calculated values for the breakdown strengths of paper and of gas, respectively (*see* Fig. 4).

The cause of the initial increase in the barrier action with pressure increase at low pressures is not apparent. Attempts to explain this effect in terms of the unusual dielectric strength of very thin films of gas (undoubtedly present in a paper sheet in the fiber lumens and elsewhere) have been unsuccessful.

With this one exception, the various phenomena appearing in the study of the effect of gas pressure on the breakdown gradient of paper have been quite completely explained by the theory just evolved. Attention is now turned to the effects of the other variables to see if these effects are compatible with the theory.

The results of the investigation of the effect of relative humidity on the breakdown gradient are listed in Table IV. From the table it can be seen that, at constant pressure, the values of the dielectric strength of paper at 0% relative humidity are greater than those at 50% relative humidity throughout the pressure range.

In order to evaluate the barrier action of the paper sheet at each humidity, the dielectric strength of the gas must be calculated according to the method previously discussed. In calculating the values for the gas at 50% relative humidity, a change in the specific inductive capacity of the fiber must be assumed since the fiber has absorbed moisture which has a specific inductive capacity of 80. No data being available on this subject, a value of 8 for the specific inductive capacity of the moist fiber was assumed. The exact value of this quantity is not critical, since it enters the formula only as the denominator of an additive term, the numerator of which is quite small. A specific inductive capacity of infinity would change the value of the calculated breakdown voltage for the gas by only about 10%. Since the experimental work of Peek *(2)* showed no effect of humidity on the dielectric strength of gas in a uniform field, the previously used value of 64.5 volts per mil at atmospheric pressure was used in the calculations. The values of the breakdown gradient for nitrogen in the field intensified by the presence of the fiber are given in Fig. 5 for both 0 and 50% relative humidity. The values at 50% relative humidity vary little from those at 0%. The difference between the calculated curve for the gradient at which discharge is initiated in the gas and the curve of the breakdown gradient of the paper and gas (the barrier action of the fiber) is plotted in Fig. 5. The barrier action is found to vary quite considerably with humidity; the values at 50% relative humidity are lower than the values at 0% at the same pressures. This difference in the barrier actions at the two humidities is attributed to the great lowering of the electrical resistance of the paper fiber as its moisture content is increased. The resistance of the fiber at 50% relative humidity is less than the resistance at 0% relative humidity by a factor of the order of 10^4 or 10^5. This lower resistance permits the space charges accumulating on the fibers to be dissipated by conduction, and gaseous discharge occurs at a lower over-all voltage.

In general, there will be two criteria for breakdown, either of which will be sufficient. In one case, the space charge will build up on the fibers sufficiently to prevent gaseous discharge from occurring. Breakdown will then occur when the field within the fiber, produced by the charges on the electrodes and by the surface charge on the fiber, exceeds the dielectric strength of the fiber. At this point, the fiber becomes conducting, the surface charges on the fiber disappear, and gaseous discharge is no longer impeded. In the other case, the resistivity of the fibers is low enough that a point is reached at which insufficient space charge can be maintained on the fibers to prevent breakdown of the gas. In this case, the fiber may act as a resistance in series with the discharge or the discharge may by-pass the fiber and take place wholly within the gas phase. Since the magnitude of the surface charge under any given set of conditions is dependent solely on the voltage in excess of that required for ionization of the gas in absence of surface charge, failure caused by inability to maintain sufficient surface charge will take place at lower voltages than failure from breakdown of the fibers. The condition of breakdown of the fibers will be looked upon as that giving rise to the maximum value of the barrier action of the paper sheet.

Figure 6 shows the effect of temperature on the breakdown gradient-pressure relationship. The values at 60°C. are lower than those at 20°C. for the same pressures.

In the calculation of the gradient corresponding to breakdown in the gas (in the field intensified by the

presence of the fibers), it is necessary to use a different value for the dielectric strength of nitrogen at 60°C. than at 20°C. At constant pressure the dielectric strength of a gas varies inversely as the absolute temperature. In calculating the dielectric strength of the gas alone, the equation for the critical voltage at 60°C. becomes:

$$V_c = [64.5 \times 293.1/333.1]\ p[t - d + d/K_3],$$

or

$$V_c = 57.1\ p[t - d + d/K_3].$$

The plot of this equation is shown in Fig. 6.

From Fig. 6 it is apparent that the difference between the barrier action of the fiber at 20°C. and that at 60° C. is well within experimental error. The temperature variation observed in the breakdown gradient of a sheet of paper in a gas is due to the variation in the dielectric strength of the gas.

The effect of density on the breakdown gradient-pressure relationship is shown in Fig. 7. The values for the breakdown gradient for the sheets of lower density are above those for the higher density sheet at the same pressures. Since these determinations were made at 60°C. the value of 57.1 volts per mil was used for calculating the dielectric strength of the gas alone in the intensified field.

The barrier action curves for the two densities (Fig. 7) show that the values for the lower density rise to a slightly higher maximum than do those of the higher density sheets.

The relative heights of the maxima can be explained as the result of two effects. First, in the higher density sheet less gas was present and, hence, the field within the fiber was more intense. This can readily be seen by referring to the calculations of the field within the gas presented earlier. For this reason the more dense sheet should break down at a lower voltage than the less dense sheet. On the other hand, however, the magnitude of the space charge necessary to prevent gaseous breakdown depends principally on the size of the gas void. Since the gas voids in the more dense sheets are, on the average, smaller than those in the less dense sheets, the space charges and the resultant fields within the fibers are also smaller. The barrier action plotted in Fig. 7 represents a balance of these two effects.

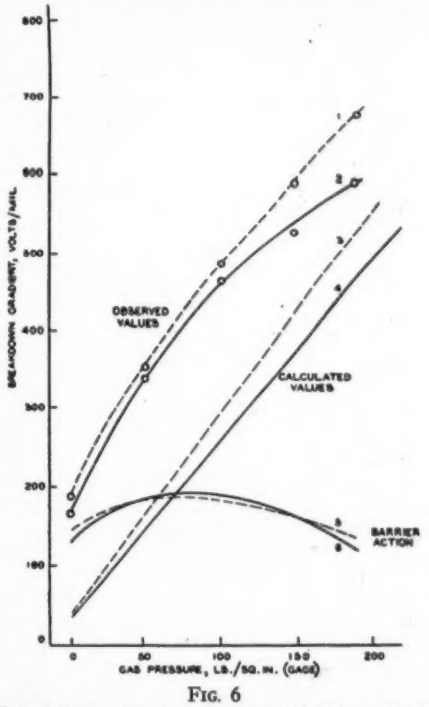

FIG. 6

The Effect of Temperature on the Observed Breakdown Gradient, the Calculated Values for Gas, and the Barrier Action. Curves 1, 3, and 5 are at 20° C.; Curves 2, 4, and 6 are at 60° C.

The effects of sheet thickness on the breakdown gradient of paper are shown in Table V and Fig. 8. The gradient is seen to fall off with increase in thickness. The curves are more or less the same shape, with those for the greater thicknesses lying below those for the lesser thicknesses.

The barrier action was calculated as described previously and is plotted in Fig. 8. The barrier action curves were all of similar shape and are arranged in the same order as the observed breakdown gradient curves—i.e., the greater the thickness, the lower the value of the barrier action at the same pressure.

The reason for the low barrier action with thick sheets is statistical in nature. In any path through the paper sheet in the direction of the field, there are a number of alternately placed fibers and gas voids. In the vicinity of breakdown, each fiber possesses sufficient charge at its surfaces to restrain the field within the gas voids to such an extent that further ionization of the gas occurs at a rate just necessary to replace the charge dissipated by electrical conduction through the fibers. The magnitude of the space charge required will depend upon (*a*) the dimensions of the gas space in which the field must be neutralized, and (*b*) the thickness of the fiber (i.e., the separation of charges of opposite sign). The sizes of the gas voids and the thicknesses of the fibers are not constant but are distributed over a range of magnitudes; hence, the surface charges present on the fibers and the fields within the fibers are also distributed over a range of magnitudes. As the field within the fibers is increased, a point is reached at which the dielectric strength will be exceeded within some one fiber. Failure of this fiber is accompanied by an increase in the stress in the other surrounding fibers. The other fibers may be capable of withstanding this additional stress, in which case equilibrium will be reestablished. If, however, the other fibers are not capable of withstanding the increased stress, then failure of the other fibers will take place and complete breakdown of the sheet will occur. As the thickness of a sheet is increased, the number of fibers which are to be encountered in any path from one electrode to the other also increases. With this increase comes the greater probability that, at some point within the test area, the distribution of gas voids, fiber thicknesses, and dielectric strengths is such that breakdown will occur at an exceptionally low value. For this reason the breakdown gradient decreases with increase in sheet thickness.

Conclusions

The first and principal conclusion to be drawn from the preceding work is that the breakdown gradient of a sheet of paper immersed in a gas is not a measure of the intrinsic dielectric strength of either the fibrous material or the gas. Rather, it is a complex phenomenon involving the dielectric strengths of both. The conditions existing prior to breakdown are primarily determined by the properties of the gas, whereas it is the failure of the fiber that finally determines breakdown. The breakdown strength of the fiber itself, however, cannot be deduced by dividing the total voltage applied across the electrode system by the electrode separation. This would give a value far too

low. The stress on the fiber at breakdown consists of the stress resulting from charges on the electrodes plus those caused by the presence of surface charges on the fiber.

Much control testing of paper for dielectric strength is carried out on unimpregnated samples in air. In view of the theory and mechanism evolved herein, interpretation of such results in terms of use requirement of this paper after oil or resin impregnation is exceedingly difficult if not impossible.

If the gas voids within a sheet of paper were to be filled with an oil, the conditions of the electric field within the sheet would be greatly changed. The oil, having a specific inductive capacity two or three times that of the gas, would bring about a more equitable distribution of the electric field. The oil would be subject to an intensified field, but not to the extent present in the gas. Accordingly, for the same applied voltage, the field within the fibrous portion would be much greater. The field would also be more nearly uniform within the oil because the refraction of the field at the fiber-oil interface would be greatly reduced.

Poor correlation between the dielectric strength of paper as tested in air and the performance of the electrical equipment fabricated from this paper is observed in practice *(21)*. Generally, variations of the impregnating process have been assumed as the cause of this lack of correlation. The real trouble may lie in the fact that the mechanism of breakdown of paper in air is quite different from that of paper in oil.

From the proposed theories and the foregoing experimental work, it is concluded that the voltage stress required to cause the dielectric breakdown of paper in a gaseous atmosphere can be divided into two portions. The first portion is considered to be gas dependent and will vary with any changes in the field within the gas or with the dielectric strength of the gas. The second portion is attributed to a "barrier action" of the fiber, which prevents breakdown from occurring until the apparent field in the gas has exceeded the dielectric strength of the gas by a certain amount. This barrier action is a fiber-dependent quantity.

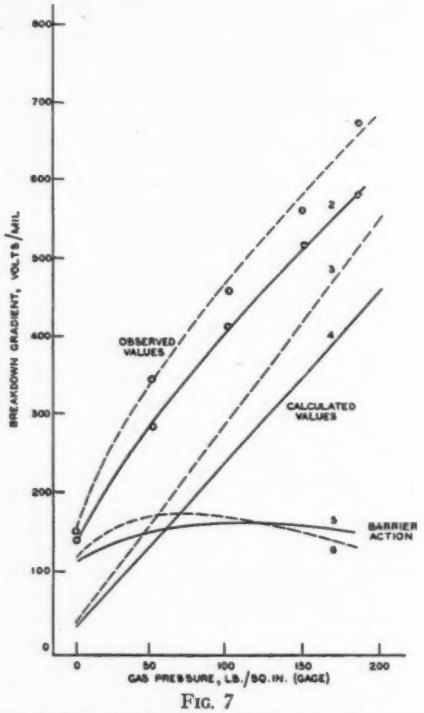

FIG. 7

The Effect of Sheet Density on the Observed Breakdown Gradient, the Calculated Values for Gas, and the Barrier Action at 60° C. Curves 1, 3, and 6 are at a density of 0.57 g./cm.³; Curves 2, 4, and 5 are at a density of 0.80 g./cm.³

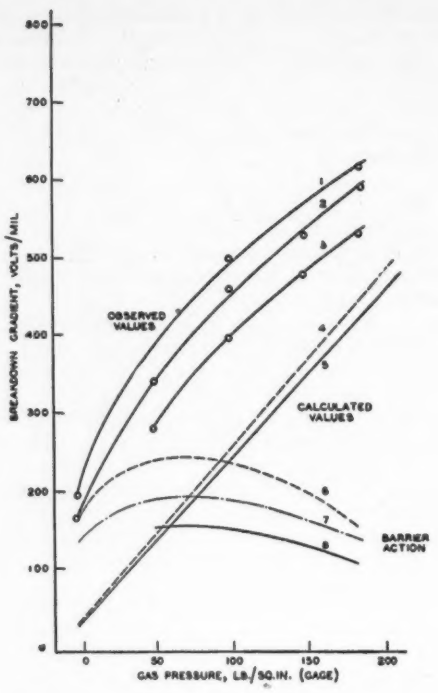

FIG. 8

The Effect of Sheet Thickness on the Observed Breakdown Gradient, the Calculated Values for Gas, and the Barrier Action at 60° C. Curves 3, 5, and 8 are at a sheet thickness of 5.5 mils; Curves 2 and 7 are at a sheet thickness of 3.1 mils; Curves 1, 4, and 6 are at a sheet thickness of 2.1 mils.

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TAPPI notes

The TAPPI-Massachusetts Institute of Technology alumni will hold a luncheon during the TAPPI annual meeting on Tuesday, February 26th at 12 noon at the Engineers Club, New York, N. Y.

W. Allen Schenk, formerly of the Polytechnic Inst. of Brooklyn is now chemist for the Riegel Paper Corporation, Milford, N. J.

Determinations and Calculations of Physical Constants of Water Suspensions of Pigments

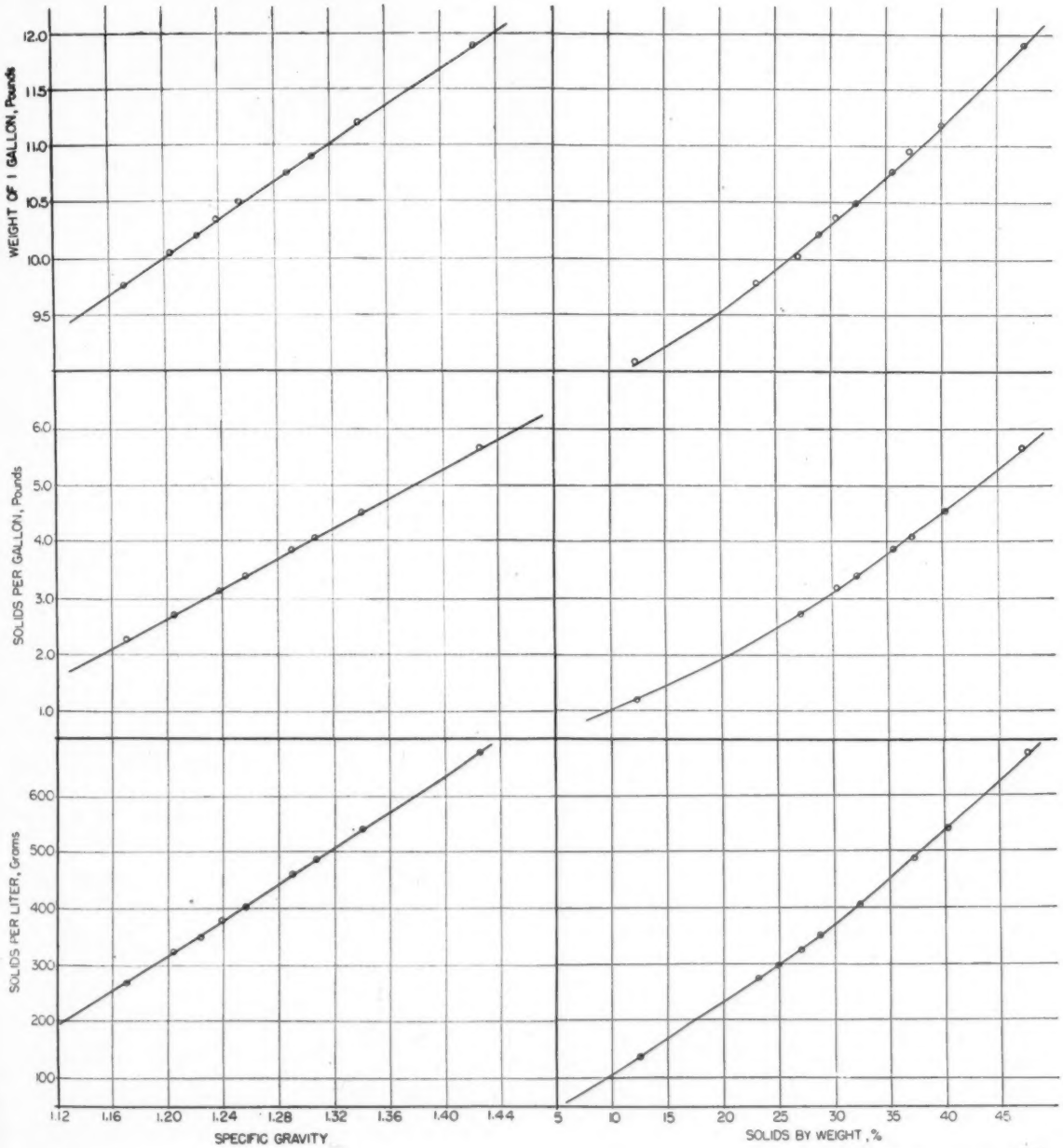
By W. V. Torrey[1]

Abstract

Using a calcium carbonate suspension as an example, calculations and curves are given to indicate a method by which the physical constants of any pigment suspension can be determined.

There are numerous cases in practical mill work when it is very convenient to be able to calculate the solid content of a water suspension of a pigment as grams per liter or pounds per gallon from either its specific gravity or from a determination of solids on a weight basis (by evaporation). After such calcula-

[1] Member TAPPI; Chemist, S. D. Warren Co., Cumberland Mills, Me.



tions have been made, graphic charts, such as Fig. 1, can be plotted which show the interrelation of the various physical constants.

Equations are given as an example and a pattern for determining these data mathematically. The specific gravity of the solids in question can be found in any standard handbook.

The equations given employ calcium carbonate for an example, and a suspension at 20% solids is chosen as a basis for the illustrative calculation. While calcium carbonate suspensions were chosen for examples, it is obvious that the equation can be adapted to any other pigment by merely substituting the proper value for specific gravity.

Calculations

Specific gravity of $CaCO_3 = 2.7$ (approximately)

x = Weight of 100 ml. of a $CaCO_3$ suspension at 20% total solids

y = Weight of solids in 100 ml. of suspension

$x - y$ = Weight of water in 100 ml. of suspension

$x = 5y$ (at 20% solids)

$100 - \frac{y}{2.7}$ = Volume in ml. of water in 100 ml. suspension or Weight in grams of water in 100 ml. suspension

Then $x - y = 100 - \frac{y}{2.7}$

Clearing:

$2.7x - 2.7y = 270\text{-}y$

$2.7x - 1.7y = 270$

$x - 0.6296y = 100$

Then as $x = 5y$

$5y = 100 + 0.6296y$

$4.3704y = 100$

$y = 22.88$ grams = weight of $CaCO_3$ in 100 ml. suspension

$5y = 114.4$ grams = weight of 100 ml. suspension at 20% solids

Thus calcium carbonate suspension at 20% dry solids possesses these constants:

Specific gravity $\frac{(114.4)}{(100)}$	1.144
Grams per liter solids (22.88×10)	228.8
Weight of 1 gallon in pounds (8.35×1.144)	9.52
Pounds solids per gallon (0.00835×22.8)	1.91
Weight of water in 1 gallon of suspension	7.61

The physical constants of water suspensions of calcium carbonate as calculated by the foregoing mathematical method are given in Table I.

TABLE I.—CALCULATION OF CONSTANTS

Specific Gravity	Solids by Weight, %	Dry Solids, grams per liter	Dry Solids, pounds per gallon	Weight of 1 gallon, pounds
1.104	15.0	165.7	1.38	9.21
1.144	20.0	228.8	1.91	9.52
1.186	25.0	286.5	2.48	9.90
1.233	30.0	369.9	3.07	10.30
1.283	35.0	448.9	3.75	10.72
1.337	40.0	534.6	4.46	11.17
1.395	45.0	627.9	5.24	11.65
1.459	50.0	729.5	6.09	12.10

After the values quoted in Table I were calculated and the graphs drawn, the work was checked by actual determinations on calcium carbonate suspensions covering a fairly wide range of concentration.

The constants as determined experimentally are quoted in Table II, and the points are applied to the curves already plotted shown in Fig. 1.

TABLE II.—ACTUAL DETERMINATION OF CONSTANTS

Specific Gravity	Solids by Weight, %	Dry Solids, grams per liter	Dry Solids, pounds per gallon	Weight of 1 gallon, pounds
1.086	12.43	135	1.13	9.07
1.170	23.10	270	2.26	9.76
1.204	26.91	324	2.71	10.05
1.223	28.74	351	2.93	10.21
1.238	30.53	378	3.16	10.35
1.255	32.30	405	3.38	10.48
1.289	35.50	459	3.83	10.76
1.306	37.20	486	4.06	10.91
1.340	40.30	540	4.51	11.19
1.425	47.40	675	5.64	11.90

New TAPPI Members

The Executive Committee of the Technical Association of the Pulp and Paper Industry has elected the following to membership.

Regine Johnson, Chef du Centre de Documentation et D'Etudes Techniques des Industries du Carton et du Papier de la Vallee de l' Aa., Saint-Omer, France, a 1913 graduate of Arques College.

Nicolas Machegiani, Owner, Fca. de Papel Nicolas Machegiani, Wilde, F.C.S., Republic of Argentina. Attended Gymnasis Liceo College.

Arthur F. Martin, Chief Chemist, Virginia Cellulose Plant, Hercules Powder Company, Hopewell, Virginia, a 1941 graduate of Massachusetts Institute of Technology.

Jacques B. Michon, Chief Engineer, Cellulose Du Pin, Paris, France, a 1936 graduate of Ecole Polytechnique College.

Harold I. Morris, Assistant Chief Chemist, National Container Corporation, Jacksonville, Florida.

Harold C. Olson, Sales Manager, Bantam Bearings Division, The Torrington Company, South Bend, Indiana. Attended University of South Dakota for four years.

Gustaf H. Panula, Associate Chemical Engineer, Armour Research Foundation, Chicago, Illinois, a graduate of the Michigan College of Mining and Technology.

Karl Patrick, Research Chemist, Canadian International Paper Company, Temiskaming, P. Q., Canada, a 1937 graduate of the University of Toronto.

Samuel J. Quattrocchi, Chief Chemist, Deerfield Glassine Company, Monroe Bridge, Massachusetts, a 1931 graduate of Rensselaer Polytechnic Institute.

William B. Scott, Manager, Consolidated Paper Corporation Limited, Grand'Mere, P. Q., Canada, a 1920 graduate of McGill University.

William S. Shaw, Director, Porritts & Spencer Ltd., Bamford Woolen Mills, Nr. Rochdale, Lancs., England.

Miss Laura Shorb, Librarian, Hercules Powder Company, Experiment Station, Wilmington, Delaware, a 1918 graduate of the University of Delaware.

Herbert J. Simmonds, President, Paper Corporation of United States, 630 Fifth Ave., New York, N. Y. Attended New York University and City College of New York.

John W. Sparks, Owner, United Insulating Company, Little Rock, Arkansas.

V. Edwin Ware, Jr., Chief Engineer, Sitroux, Inc., New Hartford, New York, a 1929 graduate of Massachusetts Institute of Technology.

Lt. Victor J. Wirpsa, A. T. Co., 11th Infantry, Camp Campbell, Kentucky, a 1943 graduate of the New York State College of Forestry.

Elliott H. Woodruff, Chief Chemist, Rayonier, Inc., Port Angeles, Washington, a 1931 graduate of the University of Washington.

Fred R. Ramage, Chemist, Latex Fiber Industries, Inc., Beaver Falls, N. Y., a 1934 graduate of Clarkson College of Technology.

Richard H. Ramsey, Head of Bureau of Tests, Brown Company, Berlin, N. H., a 1928 graduate of Northeastern University.

J. Brooke Shaughnessy, Department Manager, American Wringer Company, Woonsocket, R. I., a 1920 graduate of Armour Institute of Technology.

Philip E. Shick, Research Project Leader, West Virginia Pulp and Paper Company, Covington, Va., a 1943 graduate of the Institute of Paper Chemistry.

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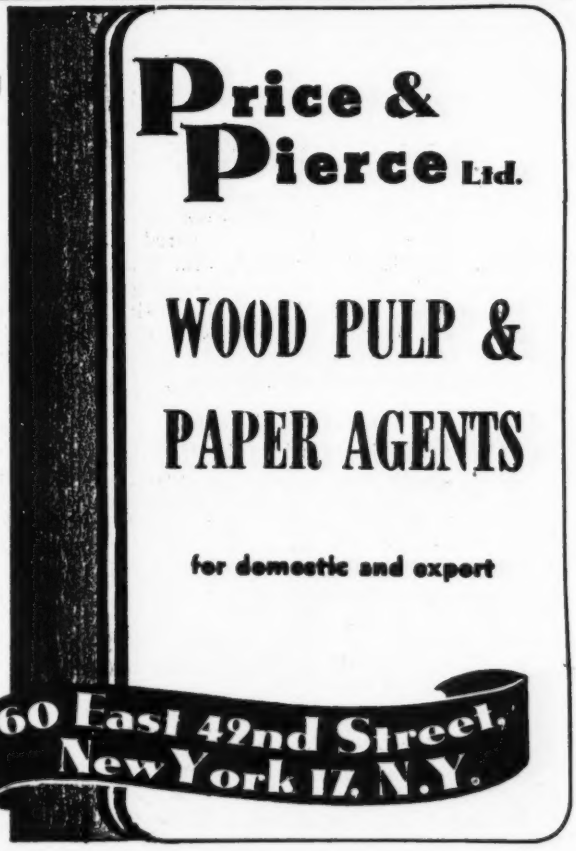

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New York Paper and Pulp Market Review

Urgent Need For Text Book Paper Is Far Above Current Supply —Wood Pulp Imports Totaled 803,313 Tons Last Year — Higher Board Prices In Effect — Demand For Waste Paper Is Heavy.

Office of the PAPER TRADE JOURNAL,
Wednesday, February 13, 1946.

Demand for book paper for text books is in so inadequate supply that colleges are experiencing great difficulty in allocating even used text books to provide for the unexpectedly large enrollment of students this year. A far greater number of returned veterans have and are enrolling in educational courses than had been foreseen.

Higher paperboard prices have been granted by OPA under Amendment 25 to Revised Price Schedule 32-M Paperboard, sold east of the Rocky Mountains. The new prices, effective February 1, 1946 include: news and chip, $54 per ton; single Manila lined chip, $65 per ton, and white patent coated, $79 per ton. All in 10 ton lots.

OPA on February 9 announced in Amendment 4 to Revised Maximum Price Regulation 129—certain converted and industrial papers that, wrapping converting and protective papers, other than kraft, containing less than 50% of sulphite or sulphate fibers and waxing papers, have been taken from General Maximum Price Regulation and put under the specific regulation for converting and industrial papers. This action, effective February 13, will not change the existing price ceilings, which will remain at each manufacturers' March, 1942 levels. It will facilitate the administration of price control, the agency stated.

The index of general business activity for the week ended February 2 declined to 113.5, from 114.2 in the previous week, compared with 146.1 for the corresponding week in 1944. The index of paperboard production was 148.4, compared with 145.0 in the previous week, and with 145.9 for the corresponding week in 1944.

Paper production for the week ended February 2 was estimated at 101.5%, compared with 88.1 for 1945, with 90.9% for 1944, with 87.2% for 1943, and with 103.7% for the corresponding week in 1942.

Paperboard production for the week ended February 2 was 93.0%, compared with 92.0% for 1945, with 97.0% for 1944, with 89.0% for 1943, and with 101.0 for the corresponding week in 1942.

Wood Pulp

Wood pulp imports into the U. S. from overseas totaled 38,319 tons in January, 1946, the Department of Commerce reports. The aggregate quantity imported from overseas since the first post-war importations for the week ended June 29, 1945 through January 31, 1946, amounted to 803,313 tons, of which 4,868 tons were from Finland. Of the total, unbleached sulphate amounted to 349,336 tons, unbleached sulphite, 328,932 tons, unbleached groundwood, 30,891 tons, and bleached sulphate 29,525 tons, were included.

Rags

Demand for cotton cuttings is reported active at this date. All grades are wanted. White shirt cuttings and unbleached muslins continue to be in strong demand. Prices are strong at ceiling levels.

Buying of old cotton rags is active at this date. Manufacturers of roofing are buying steadily. Prices are strong.

Old Rope and Bagging

The CPA has announced amendment of Order M-84, permitting manufacturers to use Manila, instead of sisal for the production of 11/4 inch rope and larger. The order permits a wider use of Manila fiber, replacing a like quantity of sisal. The over-all supply will remain unchanged for the first 1946 quarter.

Demand for scrap bagging is reported active at this date, with supplies limited. Prices continue to be reported as the ruling factor in sales.

Waste Paper

Mill demand for waste paper is reported active this week. All grades are in good demand. Prices are firm at ceiling levels. Mill receipts of waste paper in December totaled 495,268 tons, compared with 566,858 tons in November; consumption, 598,126 tons in December, compared with 681,814 tons in November, and inventories, 838,804 in December, compared with 796,998 tons in November, 1945.

Researchers Join Whitemarsh Staff

PHILADELPHIA, Pa., February 4, 1946—Eight additional researchers have joined the staff of almost 100 at the Pennsylvania Salt Manufacturing Company's Whitemarsh Research Laboratories in the expanded post-war research program under Dr. S. C. Ogburn, Jr., Pennsalt's Manager of Research and Development. Dr. Ogburn said the staff additions would round out the research being done in textile chemicals, metal cleaners and related materials, ceramic chemicals and other developments in various Pennsalt products.

The new staff members are Dr. Martin Leatherman, a former Major in the Chemical Warfare Service Technical Command; Robert H. Tiers, formerly with Pratt and Whitney Aircraft Corp.; Dr. W. J. Knapp, formerly with North American Cement Co., and recently in the U. S. Navy; Glendon B. Kyker, formerly with Hooker Electrochemical Co.; H. A. Kraftson, formerly with E. I. duPont de Nemours Company; Frederick D. Loomis, recently released from the U. S. Army; Peter Zappasodi, chemist at Pennsalt's Philadelphia plant; and, E. J. Nolan, formerly with Rohm and Haas Co.

Dr. Leatherman, who has a wide background in textile research, will be in charge of development and evaluation of new and improved textile chemicals at Whitemarsh.

Mr. Tiers will be in charge of the Special Chemicals Sales Service Laboratory and development work in new and improved metal cleaners and related materials.

Dr. Knapp, a graduate of New York College of Ceramics and the Massachusetts Institute of Technology, will work on development and evaluation of ceramic chemicals.

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MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, February 13, 1946.

BLANC FIXE—Quotations on blanc fixe continue unchanged. Demand is reported fair. The pulp is currently quoted at $40 per ton, in barrels, at works; the powder is currently quoted at $60 per ton, f.o.b. works.

BLEACHING POWDER—All-over current demand continues active. Supply situation is reported good. Quotations continue unchanged. Prices on bleaching powder range from $2.50 to $3.10 per 100 pounds, in drums, car lots, at works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more, 24 cents per pound; 2,000 pounds, 24¼ cents per pound; less than 2,000 pounds, 24¾ cents per pound, f.o.b. shipping point. Imported 24 cents.

CAUSTIC SODA — Demand continues heavy. Deliveries continue slow. Supply tight in dry grades. Output of liquid and solid higher in December. Solid caustic soda is quoted at $2.30 per 100 pounds; flaked and ground is quoted at $2.70 per 100 pounds.

CHINA CLAY — Quotations on china clay are unchanged. Current demand is reported heavy. Supply short. Domestic filler clay is currently quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton, at mine. Imported clay is quoted at from $13 to $25 per long ton, ship side.

CHLORINE — Demand heavy with temporary short supply. Paper requirements fully met. Quotations unchanged. Chlorine is currently quoted at $1.75 per 100 pounds, in single unit tank cars, f.o.b. works.

ROSIN—No offerings and sales. "G" gum rosin is quoted at $6.74 per 100 pounds, in barrels, at Savannah; "FF" rosin at $6.70 per 100 pounds in barrels, at New York; seventy per cent gum rosin size at $6.95 per 100 pounds, f.o.b. works.

SALT CAKE—Prices on salt cake are reported unchanged for the current week. December output lower at 46,652 tons. Domestic salt cake is quoted at $15 per ton, in bulk. Chrome salt cake is quoted at $16 per ton. All prices in car lots, f.o.b. shipping point.

SODA ASH — Heavy demand continues for all-over requirements. Supply tight. Bulk lot shipments steady. Bagged lots still slow. Quotations continue unchanged. Current prices, car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Corn receipts and shipments lower. Purchases of cash corn for deferred shipment 80,000 bushels; corn quotas off for 1946. Prices steady. Starch prices continue unchanged. The pearl grade is quoted at $3.72 per 100 pounds; powdered starch at $3.83 per 100 pounds; all prices in bags, car lots, f.o.b. Chicago.

SULPHATE OF ALUMINA — Demand reported steady. Supply situation improving. Quotations continue unchanged. The commercial grades are quoted at from $1.15 to $1.25 per 100 pounds, in bags, car lots, f.o.b. works. The iron free is currently quoted at $1.75 per 100 pounds, in bags, at works.

SULPHUR—Quotations on sulphur continue to conform to prevailing market prices. Demand active. Annual contracts are quoted at $16 per long ton, f.o.b. mines; the price at Gulf Ports is $17.50 per long ton.

TALC—Prices on talc continue unchanged. Demand good. Domestic grades are currently quoted at from $16 to $21 per ton at mines; Canadian at $24 per ton.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

Standard News, per ton—			
Roll, contract	*$67.00	@	—
Sheets	75.00	@	—
* OPA Maximum Price.			
Kraft—per cwt.—Carload Quantities Zone A, Delivered			
Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag	*4.375	"	—
* OPA Manufacturers' Prices.			
Tissues—Per Ream—Carlots			
White No. 1	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½	1.00	"	—
White No. 2	.90	"	—
Anti-Tarnish M.F.	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—
Toilet—1 M. Sheets—Per Case			
Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet	5.70	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.20	"	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	11.25	@	—
No. 1 Manila Wrapping, 35 lb.	6.00	"	6.25
Boards, per ton—			
News	*54.00	@	—
Chip	*54.00	@	—
Sgl. Mla. Lt. Chip	*65.00	@	—
White Pat. Coated	*79.00	@	—
Kraft Liners 30 lb.	*65.00	"	—
Binders Boards	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	32.20 " 37.75	33.35 " 39.25
85% Rag	.... "	29.90 " 35.00
75% Rag	23.00 " 27.00	24.15 " 28.25
65% Rag	.... "	22.80 " 27.75
50% Rag	18.70 " 22.75	19.90 " 24.25
25% Rag	16.40 " 20.00	17.55 " 21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$10.55@$12.75	$11.70@$14.25
No. 2	9.65 " 11.75	9.80 " 13.25
No. 3	9.20 " 11.25	10.35 " 12.50
No. 4	8.90 " 10.75	10.05 " 12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated	$13.65	@	$13.90
No. 2 Glossy Coated	12.40	"	14.00
No. 3 Glossy Coated	11.60	"	13.90
No. 4 Glossy Coated	11.15	"	12.70
No. 1 Antique (watermarked)	10.25	"	11.70
No. 2 Offset	9.60	"	11.00
A Grade E. F.	9.35	"	10.70
A Grade S. & S. C.	9.60	"	11.00
B Grade E. F.	8.85	"	10.30
B Grade S. C.	9.10	"	10.30
C Grade E. F.	8.55	"	9.70
C Grade S. C.	8.80	"	10.00
D Grade E. F.	8.25	"	9.30
D Grade S. & S. C.	8.50	"	9.70

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight Not Exceeding OPA Allowances.

Bl. Softwood Sulphite	$86.00
Unbl. Softwood Sulphite	74.00
Bl. Hardwood Sulphite	83.00
Unbl. Hardwood Sulphite	71.50
Bl. Mitscherlich	81.00
Unbl. Mitscherlich	72.00 @ 82.00
N. Bleached Sulphate	86.00
S. Bleached Sulphate	79.00
N. Semi-Bleached Sulphate	82.00
S. Semi Bleached Sulphate	75.00
N. Unbl. Sulphate	73.00
S. Unbl. Sulphate	68.50
Bl. Soda	76.00
Unbl. Soda	73.00
Groundwood	58.00

Transportation Allowances

Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area)	10.50
West Coast (out area)	16.50

	50% 80% Air Dry Weight
Northeast	11.50
Lake Central	11.50
Southern	14.00
West Coast (in area)	9.50
West Coast (out area)	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices

Domestic Rags

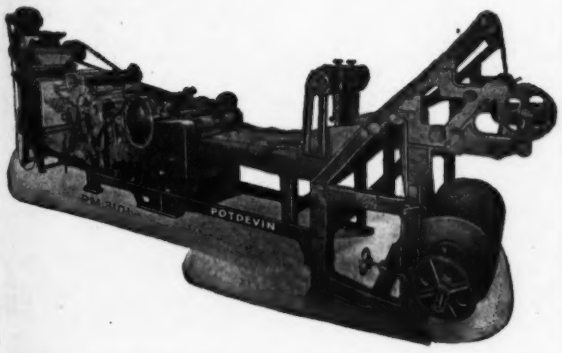
New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	6.50	@	7.25*
Silesias No. 1	—	"	5.75*
New Unbleached	6.75	"	7.50*
Blue Overall	—	"	3.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

*OPA Maximum Prices

POTDEVIN



PM 3101 GROCERY SACK MACHINE

also all kinds of Bag Machines, Aniline & Oil-Ink Presses, Waxing, Gluing, Varnishing, Laminating Machines.

POTDEVIN MACHINE CO.
EST. 1893
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POTDEVIN

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SCHOPPER TYPE
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FREENESS
FOLDING

CANADIAN STANDARD FREENESS

1/10,000" MICROMETER
BASIS WEIGHT SCALES
NEWS PENETRATION
HINDE & DAUCH CRUSH
TEAR-BURST-STIFFNESS

POCKET SCALES MICROMETERS

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Old inaccurate Scales, Micrometers and other testers recalibrated and made over like new.

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—JOHN LYLY

REPEATED often enough, flaws in a product can all too easily deface the long-established prestige of a manufacturer. Good will, on the other hand, is erected only by attending to uncounted millions of details which, through the years, have over and over again "gone right". We at Lindsay have long since decided that building is a far more pleasant process than wearing down.

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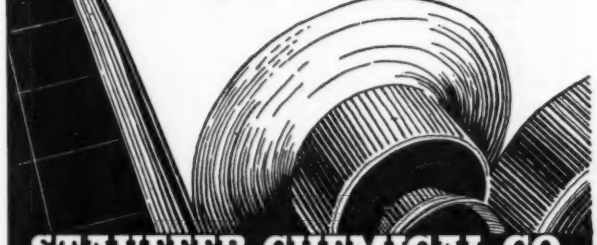
*Copperas
Cream of Tartar
Muriatic Acid
Nitric Acid
Silicon Tetrachloride
Sodium Hydrosulphide
Stripper, Textile
Sulphur
Sulphuric Acid
Sulphur Chloride
*Superphosphate
Tartar Emetic
Tartaric Acid
Titanium Tetrachloride
(*Items marked with star are sold on West Coast only.)



STAUFFER CHEMICAL CO.
NIAGARA DIVISION
420 Lexington Avenue, New York 17, N. Y. — 555 South Flower St., Los Angeles 13, Cal.
221 North LaSalle Street, Chicago 1, Illinois — 636 California Street, San Francisco 8, Cal.
424 Ohio Bldg., Akron 8, O. — Orlando, Fla. — North Portland, Oregon — Houston 2, Texas

Old Rags

White, No. 1—			
Repacked	*3.80	"	—
Miscellaneous	*3.20	"	—
White, No. 2—			
Repacked	*2.90	"	—
Miscellaneous	*2.65	"	—
Thirds and Blues—			
Repacked	*2.20	"	—
Miscellaneous	*1.30	"	—
Roofing Rags—			
No. 1	*1.55	"	—
No. 2	*1.45	"	—
No. 3 (bagging)	*1.35	"	—
No. 4	*1.35	"	—
No. 5A	*1.35	"	—
Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

Pre-War Quotations

All Prices Nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxfords	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.10
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—
No. 4 White Linens	2.25	"	3.25
No. 1 White Cotton	4.25	"	4.75
No. 2 White Cotton	3.25	"	3.75
No. 3 White Cotton	2.50	"	3.00
No. 4 White Cotton	1.90	"	2.20
Extra Light Prints	2.00	"	2.40
Ord. Light Prints	1.75	"	2.15
Med. Light Prints	1.55	"	1.95
Dutch Blue Cottons	2.25	"	2.50
French Blue Linens	3.00	"	—
Checks and Blues	2.00	"	—
Linsey Garments	1.90	"	2.00
Dark Cottons	1.50	"	1.60
Old Shoppories	1.30	"	1.45
New Shoppories	1.45	"	1.50
French Blues	2.25	"	2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	2.25	@	2.30
Wool Tares, light	2.25	"	2.50
Wool Tares, heavy	1.50	"	1.75
Bright Bagging	2.25	"	2.50
Manila Rope—			
Foreign	—	"	—
Domestic	*5.75	"	—
Jute Threads	5.50	"	—
No. 1 Sisal Strings	*4.00	"	—
Mixed Strings	2.00	"	—

* OPA Maximum Prices.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Envelope Cuts	3.12½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, one cut	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Mixed Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
Mixed Groundwood Colored Shavings	.90	"	—
Overissue Magazines	1.67½	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
Mixed Books	1.10	"	—
No. 1 White Ledger	2.30	"	—
No. 2 Mixed Ledger, colored	2.00	"	—
New Manila Envelope Cuttings, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
Extra Manilas	1.95	"	—
Mixed Kraft, Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
Triple Sorted, No. 1 Brown Soft Kraft	2.50	"	—
New 100% Kraft Corrugated Cuttings	2.25	"	—
No. 1 Assorted Old Kraft	1.75	"	—
New Jute Corrugated Cuttings	.90	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.40	"	—
Box Board Cuttings	.72½	"	—
White Blank News	1.65	"	—
Overissue News	1.10	"	—
No. 1 News	1.00	"	—
No. 1 Mixed Paper	.95	"	—
Old Corrugated Containers	.80½	"	—
Mill Wrappers	1.30	"	—
No. 1 New Light Burlap	3.00	"	4.00
New Burlap Cuttings	3.75	"	4.00

Old Papers

(F. o. b. Phila.)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½		
No. 1 Hard White Shavings, unruled	2.87½	"	—
Soft White Shavings, one cut	2.50	"	—
White Blank News	1.65	"	—
Soft White Shavings			
Misc.	2.15	"	
No. 1 White Ledger	2.30	"	
No. 2 Ledger, colored	2.00	"	
No. 1 Heavy Books & Magazines	1.92½	"	
Overissue Magazines	1.67½	"	
New Manila Envelope Cuttings	2.65	"	
No. 1 Assorted Old Kraft	1.75	"	
No. 1 Mixed Paper	.95	"	
Box Board Cuttings	.72½	"	
Kraft Corrugated Cuttings	2.25	"	
Old Corrugated Containers	1.40	"	
Overissue News	1.00	"	
No. 1 News	1.00	"	

Twines

All Prices Nominal

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.21	@	—
White Hemp	.21	"	—
Fine Polished—			
Fine India	.26	"	—
Unpolished—			
Box	.17½	"	—
Paper Makers	.17	"	—
Tube Rope	.19	"	—
Wall Paper	.20½	"	—
Wrapping	.28	"	—
Soft Fiber Rope	.19	"	—
Cotton	.25	"	—

(Hard Fiber)

Medium Jute	.18	"	—
Med. Sisal	.16	"	—
Manila	—	"	—

PHILADELPHIA

Domestic Rags (New)

(Prices to Mill)

Shirt Cuttings—	
New White No. 1	.07¼
New White No. 2	.05½
Light Silesias	.05½
Black Silesias, soft	.03½
New Unbleached	.07½
Washable Prints	.04½
Washable No. 1	.03
Blue Overall	.05½
Cottons—According to grades—	
Washable Shredding	.01¾
Fancy Percales	.04½
New Black Soft	.03¼
Khaki Cuttings—	
Unbleachable Cotton Cuttings	.03½
Bleachable Cotton Cuttings	.04½
Men's Corduroy	.03½
Ladies' Corduroy	.03
Cottonades	.03½

Domestic Rags (Old)

White No. 1—Repacked	3.80	@	—
Miscellaneous No. 1	3.20	"	—
Miscellaneous No. 2	2.65	"	—
White No. 2—Repacked	2.90	"	—
Thirds and Blues—			
Miscellaneous	1.80	"	—
Repacked	2.20	"	—
Black Stockings—			
(Report)	Nominal		
Roofing Stock—			
Foreign No. 1	Nominal		
Domestic No. 1	1.55	"	—
Domestic No. 2	1.45	"	—
Roofing Bagging	1.35	"	—
Old Manila Rope	5.75	"	—

Bagging

(F. o. b. Phila.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	3.00	@	3.50
No. 1 Clean bright—			
Sisal Strings	.04	"	—
No. 2 Clean bright—			
Sisal Strings	.03	"	—
Sisal Jute	.02½	"	.02¾
Scrap—			
No. 1	3.25	"	3.50
No. 2	1.75	"	1.80
Wool Tares, heavy	4.00	"	4.25

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices, Baled

No. 1 Hard White Shavings, unruled	2.87½	@	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
Hard White Envelope Cuts, one cut	3.37½	"	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
White and Colored Tabulating Cards	2.25	"	—
Ground Wood Tabulating Cards	1.35	"	—
White Blank News	1.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.95	"	—
Overissue News	1.10	"	—
Box Board Cuttings	.72½	"	—
New Corrugated Cuttings, Kraft	2.25	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.40	"	—
Jute Corrugated Cuttings	1.07½	"	—

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	2.75	@	2.90
Sisal Rope No. 1	*4.75	"	—
Sisal Rope No. 2	* —	"	4.00
Mixed Rope	—	"	1.35
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Manila Rope—			
Foreign	(nominal)		
Domestic	5.75	"	—
Soft Jute Rope	4.50	"	5.00
Jute Carpet Threads	3.00	"	3.50
Bleachery Burlap	8.50	"	9.00
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.00	"	3.25
South American	—	"	3.25
Wool Tares—			
Foreign	(nominal)		
Domestic	4.25	"	—
Aust. Wool Pouches	—	"	1.60
New Zealand Wool Pouches	—	"	1.10
New Burlap Cuttings	4.75	"	1.10
Heavy Baling Bagging	4.00	"	4.25
Paper Mill Bagging	3.50	"	3.85
No. 2 Roofing Bagging	1.35	"	—

* OPA Maximum Prices.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.04½	@	.04½
Fancy Percales	.04½	"	.05
New White No. 1	.06½	"	.07
New Light Flannelettes	.03½	"	.04
Canton Flannels, Bleached	.06	"	.06½
Underwear Cuttings, Bleached	.06½	"	.06½
Underwear Cuttings, Unbleached	.06½	"	.06½
Silesias No. 1	.06	"	.06½
New Black Silesias	.03	"	.03½
Red Cotton Cuttings	.03½	"	.04
Soft Unbleached	.06½	"	.06½
Blue Cheviots	.05½	"	.06
Fancy	.03½	"	—
Washable	.03½	"	—
Khaki Cuttings	.03½	"	.04
O. D. Khaki	.03½	"	.03½
Corduroy	.03½	"	.04
New Canvas	.06½	"	.07
U. S. V. D. Cuttings	.06½	"	.06½

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.00	@	—
Miscellaneous	2.80	"	—
White No. 2—			
Miscellaneous	2.65	"	—
Twos and Blues, Repacked	2.20	"	—
Old Blue Overalls	2.25	"	2.35
Thirds and Blues, Repacked	2.20	"	—
Miscellaneous	1.80	"	—
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	1.35	"	—
No. 2	1.45	"	—
No. 3	1.35	"	—
No. 4	1.35	"	—
No. 5, Quality A	1.35	"	—
Quality B	1.80	"	—
Quality C	.90	"	—
Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

(F. o. b. Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)

OPA Maximum Prices, Baled

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
No. 1 White Ledger	2.30	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
White Blank News	1.65	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
No. 1 Assorted Old Kraft	1.75	"	—
Overissue News	1.10	"	—
No. 1 News	1.00	"	—
No. 1 Mixed Paper	.95	"	—
No. 1 Roofing Rags	1.55	"	—
No. 1 Roofing Bags	1.45	"	—